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WITH

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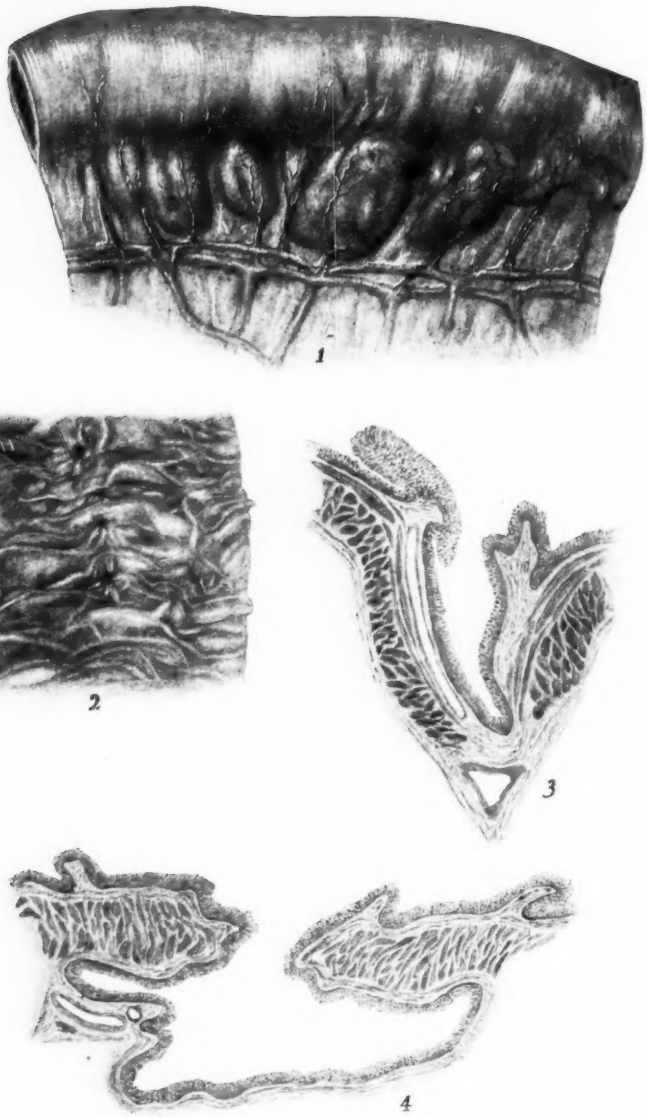

Fig. 1. *1*, A portion of the jejunum showing eight diverticula. The mesenteric vessels are seen branching over their walls. (One-half natural size.) *2*, A portion of the opened jejunum showing the valvulæ conniventes and four stomata leading into diverticula. (One-half natural size.) *3*, Vertical section of one of the smaller diverticula. This diverticulum is funnel shaped. At its apex is seen a large thick-walled blood vessel. The attenuated tunica muscularis of the intestine is intact, except at the apex of the diverticulum where it has been replaced by connective tissue. (×5.) *4*, Vertical section of one of the larger diverticula. There is no evidence of muscular tissue in the wall of the sac. A dense connective-tissue envelop (thickened tela submucosa) acts as a support to the tunica mucosa. A large blood vessel is seen to one side of the sac at the mesenteric attachment. (×5.)

False Diverticula of the Jejunum.—Frank H. Helvestine, Jr.

SURGERY, GYNECOLOGY AND OBSTETRICS

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FALSE DIVERTICULA OF THE JEJUNUM

BY FRANK HELVESTINE, JR., M.D., UNIVERSITY, VIRGINIA
Department of Pathology, University of Virginia Medical School

DIVERTICULA occur in the jejunum and ileum less frequently than in any other portion of the intestinal tract. Only 27 cases of jejunal diverticulosis have been reported in the literature. A diverticulum the wall of which contains all of the intestinal coats is classed as a true diverticulum. It is distinguished from a false diverticulum which usually has no muscularis in its wall. A distinction is also made between those diverticula which occur as congenital anomalies and those which are acquired in later life. In the majority of cases of jejunal diverticulosis, the diverticula are of the false type. They occur most frequently along the mesenteric border of the intestine and are related to the mesenteric vessels. Most of the cases observed have been in old individuals.

Many theories have been advanced to explain the occurrence of these diverticula. Klebs (1869) supposed that traction on the intestine by the mesentery is the etiological factor. Hansemann (1896) claimed that intra-intestinal pressure, from the accumulation of gas or fæcal material, causes the diverticula. The theory that venous congestion causes separation of the muscle bundles, with subsequent herniation of the mucosa, was advanced by Graser (1899). Roth (1872) mentions fatty degeneration of the tunica muscularis as a possible cause. Sudsuki (1900) regards a diminished resistance of the connective tissue about the veins as a predisposing factor.

It is the purpose of this investigation to describe two cases of false diverticula of the jejunum, and to consider the etiological factors involved in this condition. A consideration of these cases, together with those described in the literature, discloses three factors operating conjointly in the formation of acquired diverticula: (1) traction by the mesenteric vessels or traction following adhesions, (2) degeneration of the intestinal musculature, and (3) intra-abdominal pressure. Acquired diverticula develop first as true diverticula but later lose their muscular coat and become false diverticula.

CASE REPORTS

University of Virginia, Necropsy No. 489

CASE 1. *Clinical note.* The patient, a white man, age 70, came to the University Hospital complaining of frequency of urination, tenesmus, and chills and fever. A diagnosis of hypertrophy of the prostate was made. The illness of the patient on admission was so serious that very little could be done for him and on September 29, 1922, he died with symptoms of uræmia.

Necropsy note. The body is that of an emaciated white man of advanced years. The skin has an intense yellow color and the subcutaneous fat is orange yellow. The prostate, especially the middle lobe, is greatly enlarged. The wall of the bladder is much thickened, and at the fundus is a small diverticulum. This diverticulum is a small sac-like structure about 2 centimeters in diameter. The stoma opening from the bladder into the diverticulum is about 1.5 centimeters in diameter. The kidneys are small and show the changes of chronic

nephritis. The mitral valves are sclerosed and calcified. The mitral orifice is stenosed, and there is brown atrophy of the cardiac muscle. The arteries are markedly sclerosed, and nearly the entire length of the aorta is calcified. The liver shows a moderate degree of cirrhosis. The connective-tissue elements of the spleen are increased. The lungs are emphysematous, and there is a mucopurulent bronchitis.

Beginning at the duodenojejunal junction, and occurring throughout the first 95 centimeters of the length of the jejunum, are fifty-eight separate and distinct diverticula. These diverticula are small pouches varying in size from 2.5 by 2 centimeters to 0.5 by 0.3 centimeters. They arise along the mesenteric border of the jejunum and lie either on one side or the other of the mesentery. They are covered by serosa and appear to arise where the mesenteric vessels enter the gut wall. Blood vessels are seen coursing over their surface. The large diverticula are seen near the duodenum, and they are progressively smaller the farther they are from the duodenum. The larger pouches are spheroidal, saccular structures, while the smaller ones are funnel-shaped (Fig. 1, *1*). The stomata which connect the diverticula with the intestinal lumen are much smaller than the cavity of the diverticula (Fig. 1, *2* and Fig. 2). Vertical sections of these structures show that their wall is much thinner than the intestinal wall. (For Fig. 1—*1*, *2*, *3*, and *4*—see frontispiece.)

Microscopically, the intestine, at a point where no diverticula appear, shows a marked alteration of the tunica muscularis. The inner circular layer of muscle, which is normally much thicker than the longitudinal layer, is very much thinned and appears to be only about half as thick as the longitudinal muscle. The muscularis mucosa is almost entirely absent.

The smaller funnel-shaped diverticula are seen to have walls composed of mucosa, submucosa, and muscularis, except at the apex of these diverticula where there is no muscular covering (Fig. 1, *3*). At this point the muscle layers have disappeared and have been replaced by connective tissue. There is a large thick-walled blood vessel at the apex of the diverticulum.

This large saccular diverticula have no muscle fibers in their walls (Fig. 1, *4*). The muscular layers of the intestine end abruptly at the stomata of the diverticula. There is a dense connective-tissue envelop which acts as a supporting element for the mucosa of the diverticula. In the wall, and to one side of the sac, is a large thick-walled blood vessel. The mucous membrane lining these diverticula has the same appearance as that lining the intestine.

University of Virginia, Necropsy No. 497

CASE 2. *Clinical note.* The patient, a white woman, age 59, entered the University of Virginia Hospital, November 6, 1922, with a ruptured gall bladder. She was immediately operated upon and the gall bladder drained. Peritonitis followed and the patient died November 25, 1922.

Necropsy note. The body is that of an obese white woman of advanced years. There is an incision in the right upper quadrant from which protrudes several pieces of gauze drain. Permission is obtained only to enlarge this incision slightly and only the liver and a small portion of intestine are removed. The intestines are bound to the anterior abdominal wall and the loops are bound together by easily separable adhesions. There are pockets of purulent fluid formed between the loops of intestines and the anterior abdominal wall. There is pus in the lesser peritoneal cavity. There are no signs of intestinal obstruction. The spleen presents the picture of acute splenic tumor. The liver appears normal but the gall bladder is shrunken, and there is a perforation at its fundus.

Situated about 20 centimeters from the duodenojejunal junction there is a solitary diverticulum of the jejunum. This diverticulum is on the opposite side of the gut from the mesentery. The sac is about as large as a small hen's egg and its circular stoma, which opens into the lumen of the intestine, measures 2 centimeters in diameter. A little to one side of the fundus of this diverticulum is a dense, fibrous adhesion which is attached to the anterior abdominal wall. The diverticulum is of the false type. The proximity of this diverticulum to the duodenum would rule out the possibility of it being a Meckel's diverticulum.

REVIEW OF LITERATURE

In Table I, I have summarized 27 cases of diverticula of the jejunum reported in the literature.

This table shows that the average age at which jejunal diverticula have been observed

TABLE I.—SUMMARY OF TWENTY-SEVEN CASES REPORTED IN THE LITERATURE

Case	Observer	Year	Sex	Age in Years	Number of Diverticula	Position	Type
1	Cooper	1844	Male	50	Multiple	Mesenteric	False
2	Cornillon	1869	Female	30	1	Mesenteric	False
3	Neumann	1870	Male	65	1	(?)	True
4	Osler	1881	Male	65	53	Mesenteric	False
5	Moore	1883	Male	40	3	Mesenteric	True
6	Buzzi	1885	Male	77	1	Mesenteric	True
7	Buchwald and Janicke	1887	Male	6	1	Mesenteric	True
8	Virchow	1890	Male	Old	Multiple	Mesenteric	False
9	Edel	1894	Female	73	7	Mesenteric	(?)
10	Seippel	1895	(?)	(?)	Multiple	Mesenteric	False
11	Good	1895	Female	77	6	Mesenteric	False
12	Hansemann	1896	Male	14	1	Opposite mesentery	(?)
13	Hansemann	1896	Male	85	400	Mesenteric	False
14	Grassberger	1897	Male	73	1	Mesenteric	False
15	Nichols	1899	Female	64	45	Mesenteric	False
16	Hodenpyl	1900	(?)	(?)	Multiple	Mesenteric	False
17	Fischer	1901	(?)	(?)	1	Mesenteric	False
18	Gordinier and Sampson	1905	Female	46	13	Mesenteric	(?)
19	Taylor and Lakin	1910	Female	68	Multiple	Mesenteric	False
20	Balfour	1913	Male	62	4	Mesenteric	(?)
21	Latarjet and Murad	1914	Female	50	1	Mesenteric	False
22	Braithwaite	1918	Male	45	60	Mesenteric	(?)
23	Case	1920	Male	61	12	Mesenteric	False
24	Case	1920	Male	73	25	(?)	(?)
25	McWilliams	1921	Male	71	7	Mesenteric	(?)
26	Terry and Mugler	1921	Female	50	5	Mesenteric	False
27	MacKechnie	1921	Female	43	13	Mesenteric	False

is 56 years. If the case of Hansemann (1896), in which diverticula occurred in a boy of 14 years, and that reported by Buchwald and Janicke (1887), in which they occurred in a boy of 6 years, had been eliminated from the series, the age incidence would have been much higher.

With one exception the diverticula have been found along the mesenteric border of the gut in the cases reported. The large majority of the diverticula found in the jejunum have been of the false type. Rokitansky (1856), Hansemann, and others have described the false diverticula as hernia of the mucosa and submucosa through the muscular wall.

Klebs (1869) was the first to notice that there was a definite relation between the mesenteric vessels and those diverticula which occur on the mesenteric side of the intestine. He observed that the diverticula occur at points where the vessels enter the gut wall. Subsequent investigators have fully confirmed this observation. Upon the basis of this observation, Klebs advanced his theory of traction to explain the cause of the occurrence of these diverticula. He thought that either

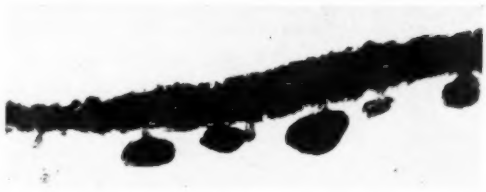

Fig. 2. Roentgenogram of a portion of the jejunum, injected with bismuth paste, showing seven diverticula of various sizes. The stomata of these diverticula are very much smaller than the sacs

excessive growth of the mesentery relative to that of the blood vessels, or in later life traction upon the mesentery by the intestine, cause the funnel-shaped areas of attachment to be converted into diverticula.

Hansemann and Graser (1899) have pointed out that when diverticula form they follow the sheath of one of the intestinal veins. Graser claimed that the veins became enlarged through congestion and in consequence pushed the muscle fibers apart. Subsequently, when this congestion was relieved, the channel occupied by the engorged veins was not completely filled up and thus offered a point of lowered resistance through which the intestinal mucosa could herniate. Sudsuki (1900) found that only a portion of his cases showed venous congestion. He suggested that degeneration of the connective-tissue fibers of the venous sheath formed a path of lowered resistance through which a hernia of the mucosa might be formed. Roth (1872) thought that fatty degeneration of the muscularis was the predisposing cause of the diverticula.

Hansemann claimed that intra-intestinal pressure, caused by accumulation of gas or fæces, might be the cause of intestinal diverticulosis. By experiments with gut removed from the cadaver in which he caused internal pressure by filling the intestines with water under pressure, Hansemann was able to produce diverticula very similar to those observed in his necropsy. Chlumsky (1899) in repeating the experiments of Hansemann and others, but using the live intestines of a dog instead of the dead gut as had Hansemann found that, contrary to the experience of the other investigators, rupture always occurred on the side opposite to the mesentery.

Most of the cases of jejunal diverticula reported in the literature have been observed at necropsies. In the last few years, with the advent of the roentgen rays and a better understanding of intestinal diverticulosis, the condition has been more often recognized clinically and at operation. Diverticula of the jejunum usually produce no symptoms. Several cases have been reported, however, in which the condition gave rise to serious complications. In the case reported by Gordinier and Sampson (1906) one of the diverticula had become inflamed, and a diverticulitis resulted with partial obliteration of the lumen of the intestine. A resulting localized peritonitis caused the formation of adhesions, with a subsequent kinking of the intestine and obstruction. Case (1920) reported a case diagnosed by X-ray examination which showed an inflammation of a large diverticulum. Terry and Mugler (1921) operated on a woman for intestinal obstruction due to an enterolith lodged in a diverticulum.

Diverticulosis has been treated operatively by resection of a portion of the gut or by inverting the sac into the lumen of the gut when this was possible.

DISCUSSION

False diverticula of the intestine occur almost exclusively in old individuals. Case noted the correlation between intestinal diverticulosis and the occurrence of diverticula of the urinary bladder. One of the cases here considered had a diverticulum at the fundus of the bladder, and a greatly hypertrophied prostate. Several of the cases reported had inguinal and femoral herniæ. Constipation is commonly associated with intestinal diverticulosis.

Rectal or vesical straining due to constipation or retention of urine would cause an increased intra-abdominal pressure. Coughing due to bronchial irritation would also have the same effect. This pressure would be intermittent, and would reach a maximum suddenly. Such a sudden pressure upon a full section of intestine would be much more efficient in causing a protrusion of the gut wall at a weakened point than the gradual increase in pressure inside of the intestine consequent upon the slow accumulation of gases or fæcal material, which would allow the intestine, through distention, to adapt itself to this pressure. The high degree of distensibility of the intestines is seen in cases of intestinal obstruction. The action of intra-abdominal pressure upon a full section of gut would be comparable to squeezing upon a toy balloon with the hands. The balloon would protrude in the spaces between the fingers. The relatively inelastic muscular coat of the intestine would correspond to the fingers and any point of lowered resistance of the intestinal wall would correspond to the spaces between the fingers. Intra-abdominal, rather than intra-intestinal, pressure, as claimed by Hansemann, is probably an important force in producing diverticula.

Normally the inner circular muscle layer of the jejunum is thicker than the longitudinal layer. Microscopic examination of the jejunum in this case, at a point where no diverticulum is present, shows that the longitudinal layer is much thicker than the circular muscle. The circular muscular layer is atrophied and thinned. With such a weakened condition of the gut wall, traction by the shortened sclerosed mesenteric vessels is probably, as Klebs believed, the initial cause of the formation of diverticula on the mesenteric border of the gut.

Such diverticula in the beginning of their formation are of the true type, containing all the coats of the intestinal wall as is the case in the smallest pockets found in my specimen and in the specimen described by Klebs. Later, probably due to progressive atrophy, now accelerated by increased pressure from within, the muscle fibers disappear and a larger diverticulum of the false type is formed.

Traction by the mesenteric vessels would not, however, explain the occurrence of the diverticula elsewhere than on the mesenteric side of the intestines. The other two factors, muscular atrophy and intra-abdominal pressure, would act the same in both cases of acquired diverticula. In Hansemann's case, in which a diverticulum occurred on the side of the intestine opposite the mesentery, traction by an accessory pancreas was considered the causative factor. Neumann (1870) reported

a similar case. Adhesions and tumors have also been described as being an initial etiological factor in these cases. In one of my cases a dense adhesion was the primary cause of the formation. Doubtless a number of these cases are congenital.

SUMMARY

1. Acquired diverticula of the jejunum occur relatively rarely. Most cases are seen in old individuals. The diverticula in the majority of cases are of the false type and occur along the mesenteric border of the intestine. There is a definite spatial relation between the mesenteric vessels and the diverticula.

2. Intra-abdominal pressure, caused by rectal or vesical tenesmus, is perhaps the force causing the development of diverticula. Atrophy of the intestinal muscle, especially the inner circular layer, is a predisposing factor in the formation of the diverticula. Local traction upon the gut by adhesion or by the mesenteric vessels when shortened following sclerosis, is probably the initial cause of the formation of these diverticula in my cases.

3. Acquired diverticula, in the earliest stages of formation, are of the true type, and may continue to develop as true diverticula. In the majority of cases, however, the muscle fibers disappear by degeneration, and the diverticula develop as false diverticula.

LITERATURE CITED

1. Balfour, D. Ann. Surg., 1913, lvii, 902.
2. Braithwaite, V. Guy's Hosp. Gaz., 1918, xxxii, 77.*
3. Buchwald and Janicke. Deutsche. med. Wchnschr., 1887, xl, 868.*
4. Buzzi. Arch. f. path. Anat., etc., 1885, c, 357.*
5. Case, J. T. J. Am. M. Ass., 1920, lxxv, 1463.
6. Chlumsky. Beitr. z. klin. Chir., 1899, xv.
7. Cooper, Sir Astley. The Anatomy and Surgical Treatment of Abdominal Hernia. Philadelphia: Lea and Blanchard, 1844, 364.
8. Cornillon. Bull. Soc. Anat. de Par., 1869, xliv, 525.*
9. Edel, M. Arch. f. path. Anat., 1894, cxliv, 400.*
10. Fischer. J. Exp. Med., 1901, v, 333.
11. Good. Inaugural Dissertation. Zurich, 1895.*
12. Gordinier and Sampson. J. Am. M. Ass., 1906, xlvi, 1585.
13. Graser. Arch. f. klin. Chir., 1899, lix, No. 3.
14. Grassberger. Wien. klin. Wchnschr., 1897, x, 149.*
15. Hansemann. Arch. f. path. Anat., 1896, cxxxviii, 347.
16. Hodenpyl. Proc. New York Path. Soc., 1900, p. 182.
17. Klebs. Handb. f. d. path. Anat., 1869, i, 271.
18. Latarjet and Murad. Lyon chir., 1914, xl, 425.*
19. MacKechnie. Ann. Surg., 1921, lxxiii, 96.
20. McWilliams, C. A. Ann. Surg., 1921, Jan.
21. Moore, N. Brit. M. J., 1883, ii, 1920.
22. Neumann. Arch. d. Heilkunde, 1870, xi, 200 (cited from Fischer).
23. Nichols, A. G. Montreal M. J., 1899, xxviii, 387.
24. Osler, W. Ann. of Anat. & Surg., 1881, iv, 202–207.
25. Rokitansky. Lehrb. d. path. Anat., 1856, ii, 36.
26. Roth. Arch. d. path. Anat., 1872, xli, 197.
27. Seippel. 1895, Inaugural Dissertation, Zurich.*
28. Sudsuki. 1900, Langenbeck's Arch. f. klin. Chir., p. 708.
29. Taylor and Lakin. Lancet, 1910, i, 495.
30. Terry and Mugler. Arch. Surg., 1921, ii, 345.
31. Virchow, R. Verhandl. d. Berl. med. Gesellsch., 1890, p. 116.

*Cited from MacKechnie.

DIVERTICULUM OF THE DUODENUM

With Report of a Case in which the Diverticulum was Imbedded in the head of the Pancreas, and a Method for its Removal[1]

By NEIL JOHN MACLEAN, M.D., M.R.C.S. (Eng.), F.A.C.S., Winnipeg, Manitoba
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THE object of this communication is to draw attention to the unusual condition of duodenal diverticulitis, and to put on record the history of a case, associated with chronic hypertrophic pancreatitis, with symptoms simulating those of severe biliary colic.

Diverticulum of the duodenum is a rare condition. Diverticulitis duodeni is even more rare. In other words, the proportion of duodenal pouches subject to inflammatory attacks, thus causing symptoms, is extremely small. Cases causing clinical manifestations have recently been recorded by Ernest K. Cullen, Dean Lewis, Walter M. Jones, and others, and many interesting articles have been written on the subject.

The condition was first described by Chomel (1), in 1710, though priority had been accredited to Morgagni. Baldwin (2), in a series of 105 necropsies, found 14 cases of duodenal diverticula, and yet the literature shows no cases diagnosed prior to operation before 1912. E. Wyllys Andrews in a communication read before the surgical section of the American Medical Association, June, 1921, gave an epitome of what had been written on the subject. The history has also been reviewed by Edmund J. Spriggs in an article in the *British Journal of Surgery*, July, 1920. Even up to the early part of the present century this condition was regarded more as an anatomical and pathological curiosity than as a clinical entity. It is only during the last decade, with the increasing efficiency of the X-ray, that the condition has been observed and studied more frequently, and has reached a place where it must be considered in the differential diagnosis of diseases of the upper abdomen.

The importance of a careful study of diverticula of the duodenum may be inferred from the ratio of their occurrence, when compared with that of diverticula in other parts of the intestinal tract. Case (3), in a very important and exhaustive article on the subject, gives the proportions in his own series of 6,847 consecutive barium meal studies as follows: duodenal diverticulosis, 85 cases, or 1.2 per cent; jejunum and ileum (other than Meckel's diverticula), 5 cases, or less than 0.1 per cent, and in the large bowel, 138 cases, or approximately 2 per cent.

EMBRYOLOGY

Lewis and Thyng (4) found numerous epithelial outgrowths in the embryo along the whole length of the intestinal tract, but especially in the duodenojejunal part. These outgrowths, which gradually disappear, were similar in nature to the buds, which give rise to the pancreas. They further found that in the pig embryos from 5.5 to 14 millimeters in length, one or two knob-like diverticula occur regularly in the duodenal region. In still larger embryos, they found diverticula occurring in increasing numbers along the small intestine, not appearing in the colon. These unexplained embryological observations do not seem to have been given the place of importance that they merit in the discussion of the etiology of intestinal diverticula.

Hansemann records a case where 400 intestinal diverticula were found, and Osler (5) also reported a case, in which the jejunum presented fifty-three. Others have observed diverticula in infants at birth. These cases strongly suggest a direct relationship between the above embryological observations and diverticula of the small intestine.

In 1899 Letulle (6) described two cases in each of which he noticed a small pouch in close proximity to the papilla of Vater, and thought that these were to be explained as congenital anomalies of development due to the budding out from the duodenum of processes, as in the formation of the liver and pancreas.

[1] Read before the meeting of the Western Surgical Association, Minneapolis, Minnesota, December, 1922.

"It was formerly taught that the pancreas developed in the vertebrates from two duodenal buds, or pouches, one dorsal, and one ventral, but it has now been shown, for most members of the group, including man, that the ventral bud in its early stages is double, so that a triple origin of the primitive rudiment, or anlage, of the pancreas is now generally accepted." (7). Two of these buds take part in the formation of the two permanent pancreatic ducts, namely, the ducts of Santorini, and Wirsung, the third undergoing atrophy. It is conceivable that should this atrophy not occur, as has been observed in other vestigal structures, that a permanent pouch or diverticulum may remain. Frequently masses of pancreatic tissue are attached to intestinal diverticula, and this has been observed by Opie (8) even in a diverticulum occurring in the ileum, and Falconer (9) reports a case occurring in the stomach with pancreatic tissue at its fundus. They have, therefore, been looked upon as a representation of an accessory pancreas.

An interesting point also in this connection, is the study of the comparative anatomy in some of the lower vertebrates, in which the pancreas is represented by numerous digestive cæca. In the salmon, for example, there are a hundred or more of these cæca, or pouches, disposed in a line along the whole length of the duodenum (Fig. 1).

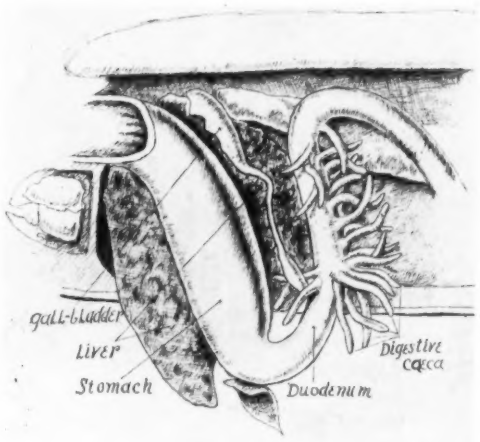

Fig. 1. Digestive cæca of the duodenum in the salmon. (Adapted from Parker and Haswell's *Textbook of Zoology.*)

ANATOMY

True and false diverticula have been described, this terminology indicating that, in the former, all the coats of the intestine are represented, in the latter the mucous, submucous, and occasionally the serous coat take part in the formation of the sac. They are usually situated on that aspect of the duodenum which is in contact with the pancreas, and frequently in the neighborhood of the ampulla of Vater, the "diverticula duodeni perivateriens" of French writers. Kath explains their frequency near the head of the pancreas as being due to the musculature of the duodenum being weakened by the ducts and large vessels penetrating its wall.

In discussing the surgical anatomy of duodenal diverticula, three points require emphasis: (1) the relation of the peritoneum; (2) the vascular arrangement; (3) the relation of the diverticulum to the pancreatic ducts.

Diverticula which arise from the anterior surface and greater curvature of the duodenum are covered by peritoneum, and are easily accessible. Those arising from the lesser curvature and posterior surface are, of course, devoid of peritoneum, and are difficult of approach.

The vascular arrangement in cases of diverticula arising from the concave border of the duodenum is important. The duodenal branches of the pancreaticoduodenal artery, and their accompanying veins, in some cases at least, arch themselves over the fundus of the diverticulum, and, as would be expected, are of a larger caliber (Fig. 2). This anatomical arrangement shows the importance of employing blunt dissection only, while freeing the sac from the surrounding structures. Furthermore, in the case of a concealed diverticulum, excision should be done only after the sac has been inverted into the duodenum and its base ligated.

The relation of the diverticulum to the pancreatic ducts demands consideration. As the pancreatic ducts lie near the posterior surface of the gland, a diverticulum, which is embedded in the head of the pancreas, will almost invariably lie anterior to the ducts.

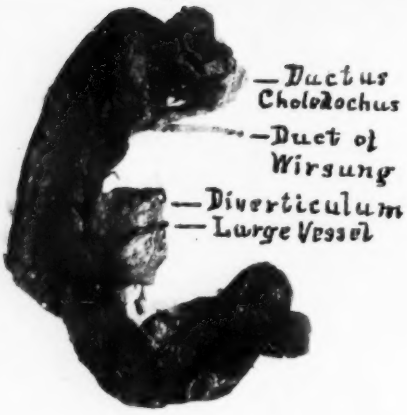

Fig. 2. Duodenum with diverticulum in the third part. Anatomical specimen in the museum of the Medical Department of the University of Manitoba. (Note the large vessel coursing over its anterior surface to the fundus. There is a similar vessel on the posterior surface.)

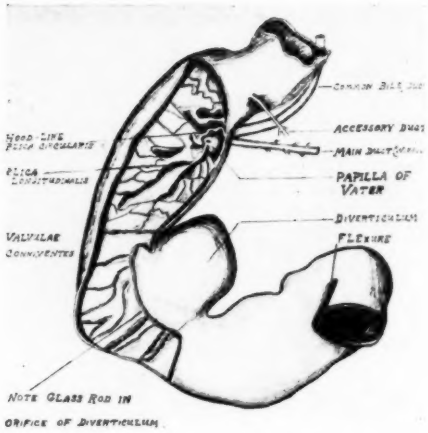

Fig. 3. Diagram of specimen shown in Figure 2.

This relationship can be further ascertained, after opening the duodenum, should this be considered necessary. The papilla of Vater is found by following the plica longitudinalis upwards, as this is the only longitudinal fold in the duodenum, the valvulæ conniventes being arranged transversely to the long axis of the bowel (Fig. 3).

ETIOLOGY

Two theories have been invoked to explain the occurrence of this condition: first, the distention or acquired, and second, the congenital theory. The points advanced in favor of the former or acquired are: (1) that they appear or produce symptoms late in life; (2) that they have been produced experimentally by distending the bowel with water (Hansemann, 1896); (3) that they occur on the mesenteric side of the bowel where the vessels penetrate the muscular coat (a locus minoris resistentiæ); (4) that in the sigmoid they have been found associated with and proximal to stricture due to carcinoma. As malignant change is common in intestinal diverticula, it is quite possible that the carcinoma developed in a pre-existing saccule.

Perry and Shaw (10) in 1893 classified diverticula of the duodenum as (1) distention, and (2) traction pouches. Increase in intraduodenal pressure results from closure of the pylorus above, and compression of the duodenum by the root of the mesentery below. This would appear to be a contributory cause, rather than a primary one, and could only produce a diverticulum where a congenital defect in the wall exists, as they rarely occur in association with the condition of megaduodenum. Traction diverticula are less usual, and are generally due to adhesions, the result of ulcer, or cholecystitis. This would appear to cause the condition that has been described as "tenting of the duodenum," rather than actual pouch formation.

Moynihan (11) and others have drawn attention to the fact that duodenal ulcer and diverticula are often associated, and a specimen, No. 1152, of such a condition is in the museum of the London Hospital. In a case recorded by Walter M. Jones (12), an ulcer was found opposite the diverticulum. He could find only three or four such cases in the literature. Ritchie's case (13) was also of this type.

The congenital theory is supported by the following facts: (1) diverticula have been found in infants at birth; (2) they are usually

single; (3) they have been found associated with diverticula of other organs, such as the bladder; (4) they have been found in other parts of the intestine, with pancreatic tissue at their apices; (5) their location near the ampulla of Vater, where the pancreatic ducts are developed from duodenal buds; (6) one case, at least, is recorded where the mucosa at the apex was thrown into folds, suggesting that it had not been subjected to full distention. Intra-intestinal pressure could not, therefore, have been the cause in this instance.

PATHOLOGY

The primary pathological changes that take place in a diverticulum of the duodenum do not differ from those occurring in the mucosa of any other part of the alimentary tract. They may be enumerated as catarrhal, ulcerative, suppurative, perforative, and malignant. These pathological changes are brought about by the retention of food particles within the pouch, which undergo stagnation, and decomposition. Other foreign substances may collect within the sac, as, in one case, 22 gall stones were found. This cess-pool of infection is responsible for all the pathological changes that take place within the sac wall, and furthermore may cause secondary changes in contiguous structures. These secondary changes may occur without gross ulceration or perforation of the diverticulum. They are due to the gradual migration of bacteria and toxins through the sac wall. This produces a hyperplastic condition in the tissues affected, as is so often seen in diverticulitis of the colon. Attention has been drawn to this by other writers, and in the author's case this fact was particularly exemplified, the sac wall being thin and soft, while the surrounding pancreas was markedly enlarged, and very indurated. Suppurative diverticulitis in this region probably does occur, but I have not been able to find a recorded case. Cases, however, are reported of suppurative diverticulitis of the colon, some with metastatic abscesses, as in the case reported by Foggie (14).

It is interesting to note that the age incidence of duodenal diverticulitis and of chronic pancreatitis are similar. In 30 cases of chronic pancreatitis, studied by Opie (15), 23 were between the ages of 40 and 70. It is at this period that the manifestations of duodenal diverticulitis have been most observed. In the writer's case the diverticulum was undoubtedly the cause of a diffuse chronic inflammation of the pancreas.

INCIDENCE OF CANCER

By analogy with diverticula occurring in the colon, one would expect to find carcinoma developing in these pouches connected with the small intestine. I have not been able to find a recorded case. W. J. Mayo (16) found carcinoma associated with diverticula of the large bowel in 31 per cent of his cases, and McGrath (17) in 25.9 per cent.

A possibility suggested itself that carcinoma occurring at the head of the pancreas might have had its origin in a pouch, and that in the examination this might have been missed. The relative frequency with which cancer develops in the head of the pancreas, as compared with other parts of this organ, suggests an extrinsic cause. Ewing (18), in 386 cases collected from the literature, found 158 diffuse, 156 limited to the head, 28 in the body, and 12 in the tail. Olliver has pointed out the necessity of very careful histological study in cancer of the pancreas, in order to avoid confusion with cancer of the duodenum and bile ducts. In the description of these tumors given by Kaufmann (19), and by Ewing, the cellular structure is pancreatic, and not that of duodenal mucosa. Ashoff (20) mentions, however, that many of the cancers of the pancreas are mucoid in character, and this would suggest an intestinal mucosal origin. Heinrich points out that "the occurrence of aberrant pancreatic tissue in the duodenal mucosa and about the head of the pancreas suggests that certain tumors, especially those involving both duodenal wall and pancreas, may arise from such aberrant tissue."

Duodenal pouches occur with a very striking relative ratio to that of primary cancer of the duodenum. Cole and Roberts (21), in a series of 30 cases, found their locations to be as follows: 23 were located in second part, 2 were located in first part, 2 were located in third part, 2 were located in fourth part, 2 were doubtful—first or second.

Jackson (22), in an anatomical study of 18 cases, found the pouches sixteen times in the first and second parts, and only twice in the third part. The incidence of cancer of the duodenum, as given by Rolleston, is, first part 8, second part 24, and third part 3, and by Geiser in practically the same ratio, 11, 51, 9 (Ewing, *Neoplastic Disease*).

Furthermore, it is generally conceded by pathologists that carcinoma is more prone to develop in an organ such as the liver or pancreas, which has become cirrhotic. As cirrhosis is the result of chronic irritation, it is conceivable that, in some cases of cancer at the head of the pancreas, an overlooked diverticulum may have been the exciting factor.

SYMPTOMATOLOGY AND DIAGNOSIS

There are no pathognomonic symptoms of this condition, and a diagnosis can not be made on clinical evidence alone. A diverticulum of the duodenum may be present without producing any noticeable ill effects. When causing symptoms, however, they must be due either to distention or inflammation of the sac, or its surrounding structures. As the site of the diverticulum varies, so will the symptoms vary to some extent; that is, symptoms due to complications rather than the original lesion. By far the greater majority of these pouches occur in the descending portion of the duodenum, and are paravaterian in type; therefore, the symptoms of an associated chronic pancreatitis, as in the writer's case, will at times becloud the clinical picture. The following symptoms are obtained from an analysis of the cases recorded in the literature. *Pain* is a most constant symptom. It varies from a dull ache to a sharp, lancinating or colic-like pain, suggesting gall stones. The pain is usually referred to the epigastrium, and in some cases through to the back, and to the right scapula, but on pressure the maximum point of tenderness is usually found above the umbilicus, and to the right of the mid-line. The discomfort or pain commences from 2 to 4 hours after food. The regularity with which this occurs is the most valuable point in distinguishing this from a primary chronic pancreatitis or cholecystitis, which is not influenced by the intake of food. The question of duodenal ulcer at once arises. In this connection the history is of the greatest importance. These cases of diverticulitis do not present the true history and symptomatology of ulcer, either gastric or duodenal (Smithies, 23). Furthermore, the pain is not relieved by eating. The close mimicry to symptoms of biliary colic is readily understood, when remembering that the majority of these diverticula develop in such close proximity to and from the same duodenal segment as the biliary tract.

Vomiting occurred in some of these cases, and jaundice was rare. An elevation of temperature has been recorded. Constipation appears to be a most constant complaint. These symptoms are common to various upper abdominal diseases, and do not of themselves constitute a characteristic symptom-complex. Likewise the symptoms of this disease manifest themselves at the age when diseases of the bile ducts and pancreas are common, and the symptoms referable to each condition cannot always be differentiated.

I believe, however, that in a patient late in life, presenting indefinite and atypical symptoms of an upper abdominal condition, in whom a duodenal diverticulum is demonstrated by the X-ray, especially where retention of barium is marked and tenderness is elicited on pressure directed over the pouch, duodenal diverticulitis can confidently be diagnosed and surgical treatment advised.

The technique employed in the X-ray demonstration of these diverticula has been dealt with by J. T. Case, in the article already mentioned. He states, however, that "having discovered a diverticulum, one should note (a) the exact location; (b) its size and general shape; (c) the dimensions of its orifice, whether narrow or free; (d) its mobility under the examining finger, guided by the fluoroscope; (e) the degree of retention; (f) relation of the shadow to a point of abdominal pain on pressure; (g) caliber of the duodenum proximal and distal to the diverticulum; (h) emptying time of the stomach."

SURGICAL TREATMENT

A diverticulum causing definite symptoms is undoubtedly surgical. The frequency with

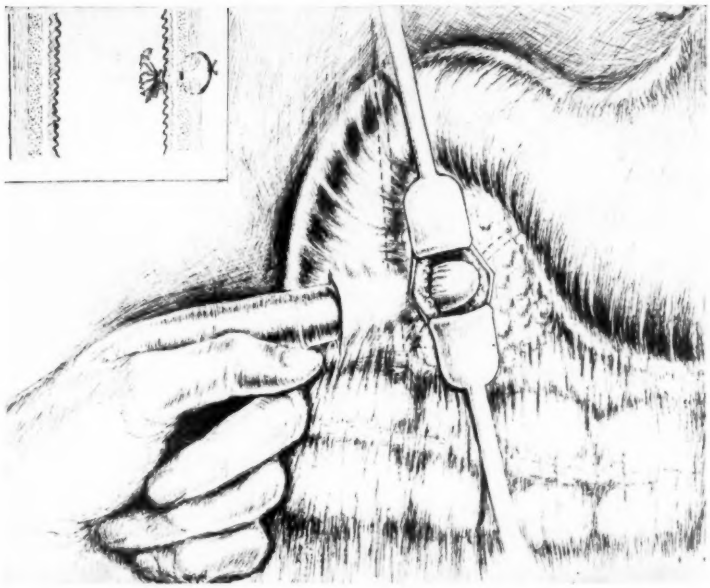

Fig. 4. The operation of transduodenal diverticulectomy. The index finger of the left hand is passed through the incision in the duodenum and then into the diverticulum as a guide. The diverticulum is freed by blunt dissection, inverted into the lumen of the duodenum, ligated, and removed.

which this condition is missed at exploratory operation emphasizes the importance of a pre-operative diagnosis. Even when a diverticulum has been demonstrated by X-ray prior to operation, cases are recorded in which it has not been found. As the most frequent situation is on the concave side toward the pancreas, and buried within its substance, this difficulty can readily be understood. These points serve to emphasize the importance of exact pre-operative localization so far as this is possible. The operations that have been performed for the relief of this condition are excision, invagination, and in one case, posterior gastro-enterostomy (Cullen, 24).

In discussing the operative treatment, diverticula of the duodenum may be divided into two types: (1) those that are on the part of the duodenum covered by peritoneum, and are obvious when the abdomen is opened; and (2) those that are concealed within head of pancreas or lie behind it or duodenum.

In the former the technique will vary somewhat according to whether the diverticulum is pedunculated or sessile. The choice lies between invagination or excision. In either case besides two rows of sutures in intestinal wall, an omental graft should be applied.

In the concealed type I have found no recorded case where the diverticulum has been removed. The technique which I adopted in the case under consideration occurred to me after opening the duodenum for the purpose of exploring the common bile duct, as in the operation of transduodenal choledochotomy, palpation being difficult because of the thickened pancreas. Considering the history of gall stones removed and the symptoms complained of, exclusion of stone in the common duct seemed essential. During this exploration I was able to introduce my index finger into the diverticulum and by using it as a guide, cut through the overlying pancreatic tissue down to the sac, and by blunt dissection separate it from the indurated pancreas. It was then inverted into the lumen of the duodenum and ligated. The incision in the duodenal wall was closed

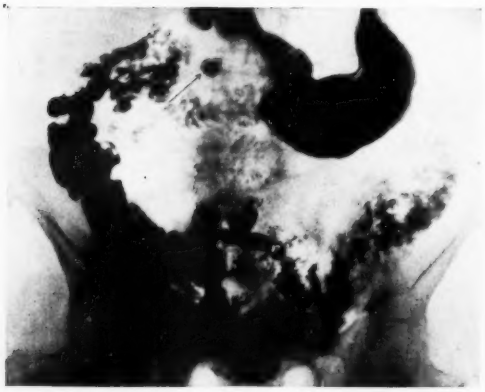

Fig. 5. Roentgenogram 5 hours after the ingestion of opaque meal, showing barium in the diverticulum.

Fig. 6. Roentgenogram 48 hours after the ingestion of opaque meal, showing barium still in the diverticulum.

and covered with an omental graft. A drainage tube was inserted down to the incision in the pancreas. This operation I have called transduodenal diverticulectomy (Fig. 4).

RECORD OF CASE

Mrs. O., age 58, January 3 1922, referred by Dr. E. W. Montgomery, with diagnosis of diverticulitis of the duodenum. The patient complained of stomach trouble, associated with recurrent attacks of epigastric pain, gas, and vomiting. The family history was negative to malignancy and tuberculosis. Patient was the mother of six children. Two children died of bronchitis in infancy. Following the first confinement sepsis occurred but with a good recovery. Menopause 3 years ago. Patient had summer diarrhœa for several years between the ages of 25 and 30. Cholecystectomy was done in March, 1918, for symptoms identical with those complained of at present (38 gall stones found).

Present illness. Following cholecystectomy, in March, 1918, she continued to have attacks of pain. For a time these attacks seemed less severe and less frequent than prior to the operation. During July and August of this year, she felt perfectly well. Since then, however, her trouble has returned with increasing frequency and severity. After eating, gas forms, accompanied by a distressing pain below the ensiform process. This pain is referred through to the back, and up to the right scapula. Belching of gas or vomiting affords her some relief. Symptoms commence about one hour after food. Solid foods of any kind, even bread and butter, disagree with her. Fluids agree better. Morphine has been required to control pain. Patient sleeps well between attacks. There are no urinary symptoms.

Examination. Heart and lungs negative. Blood pressure 130-70. There is in upper right abdomen a para-median scar, following cholecystectomy. The abdomen is negative to palpation, between attacks. During the attacks the upper abdomen is tender, particularly on the right side. There is also some spasm of the right rectus. No dullness. No mass can be felt. Pelvis and rectal examination negative.

Urinalysis: color, cloudy; reaction, acid; specific gravity, 1030; albumin and sugar, 0; microscopic, negative.

Gastric analysis: free hydrochloric acid, .05; total acidity, .20; no blood.

Blood examination: red cells, 4,970,000; hæmoglobin, 80 per cent; color index, .8; no anisocytosis; leucocyte count, 14,400. Wassermann test, negative.

Duodenal drainage was attempted twice. A Rehfuss tube was passed into the duodenum and following instillation of magnesium sulphate solution patient became distressed and complained of severe pain in epigastrium, necessitating withdrawing tube.

X-ray examination, December 28, 1921, barium series, by Dr. J. C. MacMillan (Figs. 5 and 6). Stomach is atonic and low. The pars pylorica is narrowed, in my opinion due either to external gastric pressure or adhesions, not to new-growth. The duodenal cap is normal. There is a diverticulum of the second part of the duodenum, which retains the opaque mixture for 48 hours. There is a marked gastric retention. The colon is negative.

Operation, January 9, 1922. Upper right rectus incision was made and the old scar excised. The great omentum was found adherent to the old incision, and the upper right abdomen was one mass of adhesions. The pancreas was very thickened, hard and nodular, from the head to near its tail. No fat necrosis was seen. A specimen of pancreatic tissue was removed, and swab taken from its cut surface. On account of the thickened pancreas, it was impossible to palpate the common duct, except at its upper part. The duodenum was then opened further to explore the common duct, which proved negative. The index finger was then in-

serted into the diverticulum and using this as a guide the sac was dissected out of the head of the pancreas, and invaginated into the lumen of the duodenum and ligated. The duodenum was closed, and a drainage tube inserted down to the incision in the pancreas.

Pathological report. The piece of tissue is disintegrated to such a degree that all trace of pancreatic structure has disappeared. A few collections of round cells can be recognized, suggesting the action of some chronic irritant. Beyond this it is impossible to go. *Swab.* Bacillus coli and staphylococci found. (Dr. Boyd, Pathologist.)

Patient's report. Writing December 3, 1922, patient reports: "At present I weigh 129 pounds (a gain of 26 pounds). I am feeling well and strong, and there are no indications of the former attacks."

CONCLUSIONS

1. Operations for cholelithiasis and diseases of the biliary tract are sometimes followed by unsatisfactory results. When stones are found in the gall bladder, the operator often feels satisfied and does not further explore the ducts, especially in the lower part. As I have had one case in which a stone was missed in the cystic duct, and two cases in which stones were missed in the common duct, and further as only one diverticulum in ten causes symptoms, the exclusion of stone in this case seemed most essential.

2. J. T. Case mentions that with a chronic pancreatitis, there is rapid emptying of the stomach. In this case there was a large 5-hour gastric retention. This might be explained from the low position and atonic condition of the stomach.

3. One of the striking features of the case was to find the diverticular mucosa soft and velvety and not very adherent to the surrounding pancreas.

4. The presence of micro-organisms outside the sac wall was interesting, illustrating that bacteria can traverse an apparently healthy intestinal mucosa. This has been found in other conditions, as bacteria have been discovered in the mesenteric glands without gross change in mucosa of bowel.

5. In discussing the symptoms of this case, the following questions arise: (1) were they due to distention of the sac from food becoming lodged therein; (2) were they caused by pressure on the pancreatic ducts from the distended sac; (3) were they due to a low-grade non-suppurative infection of the pancreatic tissue? The last would seem to be the more probable, as distention would occur regularly after every meal, and if the symptoms were due to pressure on the pancreatic ducts, one would expect to find some evidence of fat necrosis.

6. This case furthermore demonstrates the importance of a pre-operative diagnosis and localization of the diverticulum, and shows how readily this condition can be missed at an exploratory operation.

7. A duodenal diverticulum having been demonstrated by the X-ray, it would be for the clinician to decide whether it was a case of diverticulosis or diverticulitis. Furthermore, the surgeon in operating, if he finds an associated pathology more likely to be causing the symptoms than the diverticulum, would be wise to deal with that primarily, and await results. In this case the surgeon who removed the gall bladder, containing gall stones, even had the diverticulum been demonstrated at that time, did the wisest thing for the patient.

REFERENCES

1. CHOMEL. Histoire de l' Académie royale, Paris, 1710.
2. BALDWIN. Anat. Rec., V, 121.
3. CASE, J. T. J. Am. M. Ass., 1920, lxxv, 1463.
4. LEWIS and THYNG. Am. J. Anat., 1908, vii.
5. OSLER, W. Ann. Anat. & Surg., 1881, iv, No. 5.
6. LETULLE.
7. MAYO ROBSON and CAMMIDGE. The Pancreas, Its Surgery and Pathology.
8. OPIE, E. L. Diseases of the Pancreas. 2d ed., p. 46.
9. FALCONER, A. W. Lancet, Lond., 1907, p. 1296.
10. PERRY and SHAW. From Deaver and Ashurst, Surgery of the Upper Abdomen, 2d ed.
11. MOYNIHAN. Duodenal Ulcer.
12. JONES, W. M. J. Am. M. Ass., 1922, lxxviii, 1706.
13. RITCHIE, H. P. Surg., Gynec. & Obst., 1917, xxv, 485.
14. FOGGIE, W. E. Lancet, Lond., 1921, p. 1357.
15. OPIE, E. L. Am. J. M. Sc., 1902, cxxlii, 845.
16. MAYO, W. J. J. Am. M. Ass., 1917, lxix, 783.
17. MCGRATH. Surg., Gynec. & Obst., 1912, xv, 429.
18. EWING. Neoplastic Diseases.
19. KAUFMANN, E. Pathologische Anatomie, 1909.
20. ASHOFF, LUDWIG. Pathologische Anatomie, 1918.
21. COLE and ROBERTS. Surg., Gynec. & Obst., 1920, xxxi, 376.
22. JACKSON, C. M. J. Anat. & Physiol., 1908, xlvi, Jan.
23. SMITHIES, FRANK. Discussion of Case's paper. J. Am. M. Ass., 1920, lxxv, 1470.
24. CULLEN, E. K. Arch. Surg., 1921, May, 542.

POSTOPERATIVE VENTRAL HERNIA[1]

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THE development of hernia in the incision following abdominal operation is such a common and distressing complication that I feel justified in discussing it and adding one more paper to the already voluminous literature on the subject. As Judd says, it is often true that the development of postoperative hernia is a secondary consideration and is often unavoidable following severe and extensive abdominal operations; yet many times this condition can be prevented by the proper choice and manner of closing the primary incision. Recurrences following attempted repairs of such hernias are also so very common that I feel sufficient care is not taken in the pre-operative treatment, in the selection of the suture material to be used, in the type of closure advisable in any given case, and in the postoperative treatment.

It is hard to determine with any degree of accuracy the incidence of postoperative hernia, as a large majority of the patients probably never come to the surgeon for relief, but are content to put up with the inconvenience of an abdominal binder or some style of truss rather than face another operation. This is particularly true of the uniform bulging of the whole length of the incision due to a weak scar which, as a rule, is attended with very little or no pain, and which after attaining a certain size remains stationary. The patients who seek surgical relief are, as a rule, having sufficient symptoms to interfere with their regular work, either as a result of pain (which in many cases is constant, but in others is in the form of acute attacks as the result of partial, or more rarely, complete obstruction) or from the size and inconvenience of the large protruding mass.

From January 1, 1915, to December 31, 1919, 28,970 abdominal operations were performed at the Mayo Clinic, and of these 596 (2.05 per cent) were for the repair of postoperative hernia. Besides these there were several operations for recurrent umbilical and recurrent direct inguinal hernias which should also be correctly classified as postoperative hernia, but will not be included here.

In a series of 155 operations for various forms of hernias, Deaver and Ross reported 7 postoperative hernias. Dodge, in 1919, reported only 11 postoperative ventral hernias in 638 operations for hernia, but his patients were all young adult males and not of the type in whom we expect abdominal operations to be followed by incisional hernias. Coley, in 1917, published statistics from the Ruptured and Crippled Hospital, and reviewed 5,617 operations for various forms of hernias. He reports only 94 ventral hernias, but his data are somewhat misleading as to the true incidence of the condition since the majority of his patients were children.

During the 5 years in which the 596 patients were operated on for incisional hernias at the Mayo Clinic, we also operated on 4,249 inguinal hernias, 217 femoral, 327 umbilical, and 113 miscellaneous hernias. The postoperative hernia, therefore, constitutes 14.66 per cent of the total number of operations for hernia. In this series 84 cases were recurrent. In 134 the original operation had been done at the Clinic and in 462 it had been done elsewhere.

Postoperative ventral hernias develop in the majority of cases as the result of sepsis. This is unavoidable in many cases since drainage is instituted at the time of the primary operation, and a wound that has any form of drainage protruding from it for several days can not be kept free from infection. The next most common cause is probably increased intra-abdominal pressure as the result of paralytic ileus, vomiting, cough, hiccough, sneezing, straining during lavage, or as the result of urinary retention, or while at stool. In other cases extreme restlessness, with frequent changing of position and the necessary use of the abdominal muscles, tends to

[1] Read before the Western Surgical Association, Minneapolis, Minnesota, December, 1922.

cause cutting of sutures, hæmorrhage between the co-aptated surfaces and an excessive amount of œdema in the edges of the wound which interferes materially with solid union. Another potent cause is improper closure. This may be the result of an attempt to save time following a severe operation, or more often an attempt to save time for the surgeon. In some cases the upright posture is resumed, or too violent exercise commenced before the scar is strong enough to stand the increased strain. A rare cause is poor healing in debilitated, starved patients in whom there is little or no attempt at union in the ordinary length of time required. All these predisposing causes to weaken wounds are increased when the patient is overweight.

The symptoms naturally vary greatly depending on the nature of the hernial content, whether or not it is adherent, incarcerated or strangulated, whether it is in the upper or lower abdomen, the type of work the patient is doing, and last, but not least, his psychological attitude. It is not uncommon to meet patients who consider themselves invalids because they have small ruptures or weak bulging wounds that are not giving definite physical symptoms and that are not likely to become strangulated. Other patients will continue to do heavy manual labor, with little or no complaint, in spite of large irreducible postoperative hernias.

TREATMENT

Treatment will naturally be divided into preventive treatment, which will include the preparation of patients for any abdominal operation, the closure of abdominal wounds, the type of anæsthesia to be used, and the postoperative care. Under curative treatment will be considered the various types of operative closure for incisional hernias, suture material, postoperative care, and, if operation is not performed, mechanical support.

Patients most likely to develop postoperative hernia are obese, and have pendulous, flabby, abdominal walls. This condition is most often met with in healthy women who have had frequent pregnancies and are above normal weight, and in men who overeat and drink and do not take sufficient exercise.

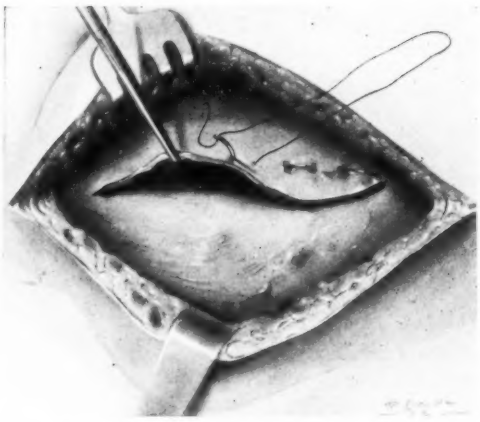

Fig. 1. Plastic overlapping closure in cases in which anatomical closure is not possible.

Pre-operative medical management of such patients is of the utmost importance. They should be put to bed on a restricted diet with increased elimination in order to reduce weight and to lower blood pressure. Not only will postoperative hernias be less common following such care, but the operative mortality will be greatly reduced. Local nerve blocking is the anæsthesia of choice, and if necessary, supplemented by nitrous oxide or ether to aid relaxation.

TECHNIQUE

Nature is very kind to the surgeon and no matter what technique is used in the closure of a wound, provided there is fair apposition of the cut surfaces, the result will be a solid wound in most cases, if there are no complications such as infection or other postoperative condition that will tend to increase the strain on the opposed surface, or a constitutional state that will interfere with healing.

The manner of closing wounds naturally depends on the tissues concerned. These, of course, vary in different parts of the abdominal wall and a closure that would be satisfactory in one place would not be satisfactory in another. Before discussing the various types of closure I shall consider the relative frequency of postoperative hernias, as observed in the Mayo Clinic. Of a total of 592 cases, 84 were recurrent, 189 occurred in the

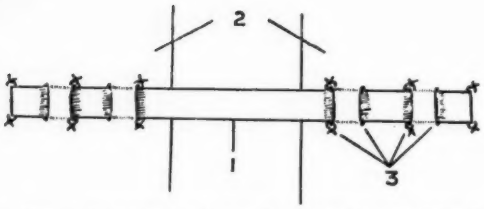

Fig. 2. Diagram showing method of fixation of "strip" transplant by weaving through slits in the fascia on either side of the gap. *1*, "Strip" transplant; *2*, edges of gap in fascia; *3*, slits through which strip is woven and fixed by sutures (Gallie and LeMesurier).

straight incisions in the rectus muscle, 173 in the low middle line incisions, 123 in the split muscle or McBurney incisions, 15 in high middle line incisions, and the remaining 12 in the rarer forms of incisions. These data are not of much value since I do not know the relative frequency with which these incisions were used; this varies naturally with different operators. Many of the 512 patients of whom we have fairly complete records were operated on originally for acute abdominal conditions, and in 280 (54.68 per cent) some form of drainage was used. I shall emphasize only a few important points in closure of wounds:

1. Approximation must be accurate, or better, the peritoneum may be overlapped or duplicated, special care being taken that no tags of omentum escape between the stitches.

2. Hæmorrhage must be controlled as thoroughly as possible.

3. Muscle tissue should be approximated without undue tension.

4. Fascia should be overlapped wherever possible.

5. All buried suture material should be of catgut or some absorbable suture material.

6. Tension suture should be inserted to guard against excessive strain on the approximating sutures when plain catgut is used. Silkworm gut is very satisfactory and in my opinion a through-and-through suture is preferable.

I should like to direct attention to the fact that in the series of 512 cases, 173 (33.78 per cent) occurred in low middle line incisions, and in my experience this is about the only location in which postoperative hernias, which were not preceded by infection, occur. It is

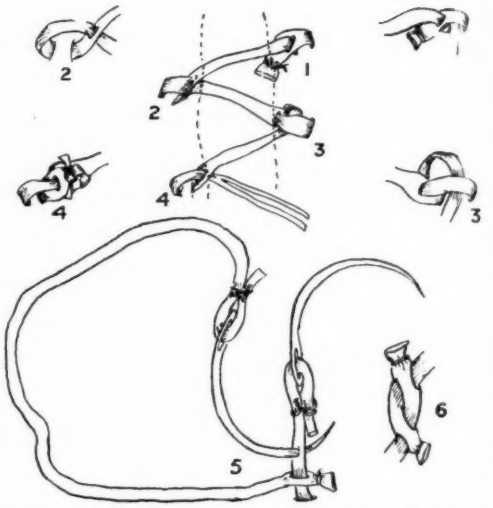

Fig. 3. Diagram showing method of inserting fascial suture. *1*, Anchoring suture at commencement by looping it through itself; *2*, fixation of suture at each loop by passing it through itself; *3*, fixation by passing suture through itself and tying in knot; *4*, ending of suture by passing through itself, splitting, and tying ends in knot; *5*, method of joining new suture to one that has been inserted; *6*, joint completed (Gallie and LeMesurier).

true that a weak scar with considerable bulging often follows extensive incisions in the upper part of the rectus muscle without infection, as the result of atrophy of the inner fibers of the muscle following cutting of several branches of the motor nerves, but these cases seldom come to secondary operation, whereas a weak scar in the low middle line generally gives trouble. To guard against future trouble in a low middle line incision, it is advisable to open the sheath of the rectus on each side and make a closure exactly the same as in the ordinary straight incision. In women who have had repeated pregnancies there is often a weak point just below the umbilicus as the result of marked diastasis of the recti muscles. In these cases it is advisable to excise the umbilicus and overlap the aponeurosis for a short distance.

PRE-OPERATIVE TREATMENT OF POSTOPERATIVE HERNIA

The size of a hernia is no guide to the amount of trouble it may give, as a small

opening through which a single knuckle of bowel or tag of omentum may become incarcerated, or strangulated, is often much more dangerous than a large opening through which a large quantity of abdominal contents protrudes and may even be adherent or irreducible. No preliminary treatment is necessary for the small hernias, and their closure will be exactly the same as that employed for the larger ones.

Massive hernias, particularly in obese patients, require special pre-operative treatment, not only to make the surgical risk less, by reducing the weight of the patient, lowering the blood pressure, and aiding elimination, but to reduce the herniated mass as much as possible. The sudden reduction at the time of operation would greatly increase the intra-abdominal pressure; this in itself adds to the danger of recurrence, and in many cases is the cause of marked cardiac and pulmonary embarrassment. Under dietetic management and rest in bed, either in a hospital or at the patient's home, from 20 to 30 pounds can be taken from the weight in from 3 to 6 weeks. During this time the hernial protrusion is returned and retained in the abdominal cavity as much as possible.

When deaths occur following operations for large postoperative or umbilical hernias, the most striking symptoms are of cardiac or pulmonary embarrassment, but there is always a diminished urinary output with definite symptoms of a metabolic upset. I am sure that investigations recently started in the Clinic of the blood chemistry of these cases will be of interest and possibly of some aid in determining when it is safe to operate.

The type of operation best suited to any given case depends on the conditions found. If an anatomic closure can be effected without undue tension, it is the method of choice, but in the great majority of cases this is not possible on account of marked loss of the muscle tissue as the result of infection or injury to the nerve supply. In these cases a plastic overlapping, on the same principle as the Mayo operation for umbilical hernias, is advisable. It is extremely important to remove all possible fat from the surfaces that are to be brought into apposition, and to

Fig. 4. Fascial suture at end of 13 weeks, showing method of insertion. The suture is now a rounded, glistening cord, resembling tendon in gross appearance (Gallie and LeMesurier).

obliterate any space in which serum or blood might accumulate. Wherever possible, the overlapping should be vertical rather than from side to side in order to avoid the pull of the lateral abdominal muscles (Fig. 1).

A mistake often made is an attempt to overlap too much. Undue tension is a common cause of failure and overlapping of 2 centimeters is often preferable to one of 5 centimeters. Twenty-day chromic catgut No. 1 or No. 2 is the suture material of choice. If satisfactory union is not well started in 3 weeks, it will never be obtained. Permanent suture material will simply act as a foreign body and will often lead to trouble. Any tension greater than No. 2 catgut will stand will cut the tissue, and œdema, which will interfere with healing and predispose to recurrence, will result. Tension sutures of chromic gut are best applied after the insertion of one row of a continuous mattress suture which closes the peritoneal cavity; if desired, the knots can be tied between the flaps. Accurate approximation is then made by placing the overlapping flap on top of the lower flap. Either continuous or interrupted sutures may be used. In many cases such closure is far from perfect, as it is simply an overlapping of scar tissue with little or no

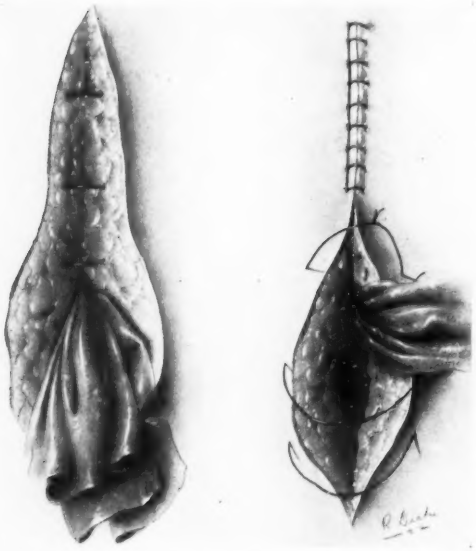

Fig. 5. Method of using rubber tissue drain following operation for massive hernia. Secondary closure.

muscle, and for these Gallie and LeMesurier have advocated the use of "living sutures" made of narrow strips of fascia lata from the patient himself and closing the hernial opening in much the same way that a hole in a stocking is darned (Figs. 2, 3, and 4). This method is much better than a mass implant of fascia lata as advised by some writers. I have not adopted this technique in detail, as I believe a great deal can be gained by the simple overlapping of scar tissue and I never sacrifice it. However, in several recent cases I have reinforced the regular plastic overlapping closure with several living sutures taken from the fascia lata and am satisfied that it adds materially to the strength of closure and is a real advance in the treatment of such cases. The three layer method, as advised by MacLean for the closure, of umbilical hernias associated with a marked diastasis of the recti muscles may also be useful in some of these cases.

Bevan advises whipping the edges of the hernial opening together without opening the peritoneal cavity. This might be satisfactory in small hernias, but I see no advantage or added safety in the method and in cases of adherent intestinal loops, obstruction might result from the altered position.

Gibson and others have advocated pedicle flaps of fascia to close the hernial opening. I have had little experience with it. I believe that the overlapping method, with the addition of a few reinforcing stitches of living sutures, will usually afford the best results.

After closing the deeper layers, the best method of closing the superficial layers is often a problem, particularly if it has been necessary to make a large incision and if the patient is very fat. The average weight of these patients in the Clinic was 163.8 pounds.

Tension sutures of silkworm gut afford added security if the abdominal walls are thin; the sutures may remain 15 or 18 days. In obese patients, however, with a layer of adipose tissue of 7.5 centimeters or 10 centimeters between the knot on the skin surface and the deeper layer that is being united, I do not believe this of any value, but rather a danger because of the possibility of cutting and infection.

Drainage with the ordinary tube has not been entirely satisfactory and attempting to close without drainage often results in the collection of a large amount of blood, serum, and broken-down fat which later, becoming infected, causes a great deal of trouble. To overcome this I have recently packed the wound with rubber tissue, and closed it about half way in the ordinary manner, leaving loose stitches in the other half of the wound to be tightened in 48 hours, after the removal of the rubber (Fig. 5). I have tried this in a few cases and found it very satisfactory. The advantages claimed for this partial secondary closure are: removal of a large quantity of blood and serum which would otherwise be retained in the wound and possibly cause late infection, removal of fat that would be absorbed and predispose to fat embolism, and the slight inconvenience to the patient since it can be done while he is in bed. If the patient is nervous a little nitrous oxide and oxygen may be used.

RESULTS

Results are very satisfactory; nevertheless recurrences are fairly common. In our series

of patients 84 had had at least one previous operation. Of the 596 patients operated on, 134 (22.48 per cent) have weak wounds with more or less bulging, but only 54 (5.7 per cent) are complaining of slight inconvenience, and only 20 (3.35 per cent) report no improvement. Ten of these patients had been operated on before coming to the Clinic, and I believe I am safe in saying that the oftener a hernia is operated on the harder it is to obtain a cure. Coley and Hoguet reported 11 recurrences in 103 cases.

MORTALITY

The mortality for postoperative hernias is high. This is due to the fact that a relatively large number of the patients are extremely poor risks. McGlannan estimates the mortality at 6 per cent in the massive hernias without strangulation, and as high as 50 per cent in the strangulated. In our series there were only 4 deaths (1.78 per cent), but in none of our cases did strangulation necessitating resection occur, and the majority of them would not be described as massive.

BIBLIOGRAPHY

1. Bevan, A. D. Postoperative ventral hernia. Surg. Clin., Chicago, 1920, iv, 775–781.
2. Coley, W. B. Hernia. Progr. Med., 1917, ii, 17–46.
3. Coley, W. B., and Hoguet, J. P. Operative treatment of hernia. A consideration of 8589 cases of hernia treated by radical operation from 1891 to 1918, with special reference to methods of operating and end-results. Ann. Surg., 1918, lxviii, 255–268.
4. Deaver, J. B., and Ross, G. G. The mortality statistics of two hundred and seventy-six cases of acute intestinal obstruction. Ann. Surg., 1915, lxi, 198–203.
5. Dodge, W. T. Report of six hundred and thirty-eight herniotomies. Mil. Surgeon, 1919, xliv, 385–388.
6. Gallie, W. E., and LeMesurier, A. B. The use of living sutures in operative surgery. Canadian M. Ass. J., 1921, xi, 503–513.
7. Gibson, C. L. Operation for cure of large ventral hernia. Ann. Surg., 1920, lxxii, 214–217.
8. Judd, E. S. The prevention and treatment of ventral hernia. Surg., Gynec. & Obst., 1912, xiv, 175–182.
9. McGlannan, A. Massive umbilical and ventral hernias. Surg., Gynec. & Obst., 1915, xx, 700–704.
10. MacLean, N. J. The extreme pendulous abdomen and its surgical treatment by a new three-flap operation. Surg., Gynec. & Obst., 1919, xxviii, 190–194.

LUNG COMPRESSION BY HEAVY LIQUID PARAFFIN IN THE TREATMENT OF LUNG TUBERCULOSIS, BRONCHIECTASIS, AND LUNG ABSCESS

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ONE of the first principles in the treatment of all diseases, no matter what part is affected, is rest. In diseases of the lung, it is impossible to give rest unless some mechanical means is employed. When we consider the number of excursions the lung pursues in its daily performance of its duty (about 28,000), we can readily see the difficulties there are in treating its disease located here. When tuberculosis is found elsewhere in the body, every effort is made to immobilize the part.

Since the beginning of medicine, pneumothorax has been practiced to immobilize the lungs. Hippocrates (1) described its use in the fourth century, B.C. To A. K. Krause is due the credit of refreshing the literature on this point. James Carson (2) of Liverpool, England, in 1821 described some experiments on animals with it and thought it could be used in the human being. James Houghton (3) in 1832 reported cases which had improved, following spontaneous pneumothorax. Folani, of Pavia, Italy, reported in an Italian medical journal in the early nineties, the use of nitrogen in the treatment of chronic tuberculosis. The late J. B. Murphy (4) of Chicago, in 1898 put the treatment on a more practical basis. After Murphy, a number of men acting on his suggestion, reported very encouraging results. Later, Brauer (5) and others took up the work in Europe, and reported cases. During the past 15 years a number of men reported successes, among them being Sachs (6), B. Stivelman (7), and A. F. Miller (8), of Novia Scotia. The brilliant results accomplished as revealed in some of the reports make one wonder why other institutions have not used nitrogen. The reason may be the difficulties that attend its use in producing pneumothorax, for it is sometimes necessary to repeat the procedure at intervals of 10 days to 2 weeks, and effusion occurs in about 55 per cent of cases.

During the past year I have been carrying on experiments with rabbits and cats, with the hope of finding something that would not produce effusion nor be absorbed as readily as nitrogen. I have been using principally heavy liquid paraffin, but in a few instances I have used light paraffin. These experiments were carried out in the Physiology Research Laboratory of the University of Buffalo, during the summer of 1922. The animals used, 6 rabbits and 16 cats, were of different sizes, ages, and breeds, and were fed upon the same diet before and after operation —a full ordinary diet. They were allowed to run loose in a large, well ventilated, cement room opening into a high-walled run-way.

TECHNIQUE

Breakfast was omitted on the day of operation. The animal was anæsthetized—ether or nitrous oxide and oxygen being used. The anterior and lateral aspect of the right chest was shaved, and the skin sterilized. When 100 cubic centimeters of oil was injected into cats anæsthetized with ether, 3 died; when compression anæsthesia with nitrous-oxide and oxygen was used, we could inject 150 to 200 cubic centimeters without mortality. From this we may infer that, when inducing pneumothorax in individuals who suffer from pleural shock, compression anæsthesia with oxygen will prevent fatalities.

With the exception of the first two animals, the oil was injected through a 14-gauge needle connected to a 50 cubic centimeter Luer syringe, with an Adler valve attached for refilling. The puncture was made in the anterior axillary line in the sixth interspace.

Autopsies have been performed on all the animals. The following is a report made

November 16, 1922, by B. M. Roman, pathologist to the Buffalo General Hospital.

A complete atelectasis was not brought about even on the oldest experiments. On the other hand the lung in the cavity which contained oil was found to be generally somewhat smaller, and also there was total collapse of one or the other lobe. This condition was also occasionally found on the non-injected side which contained oil.

On the injected side, the lung always showed, in patches, a pneumonic process. The number of these patches increased as the time of contact of the oil with the lung lengthened, excepting in the experiment in which the oil had been injected into the chest cavity only 14 days. Besides this pneumonic process in the lung, the pleura and the soft parts of the mediastinum were diffusely thickened in the form of patches.

Absorption of the oil apparently did not take place within the circulation. What could not be recovered from the chest cavity in a free state could easily be accounted for by its accumulation in the tissues.

Fate of oil. 1. In some cases depending upon factors to be determined, the oil passed through the mediastinum to the opposite side, possibly by a process of suction, in which case it sometimes became coarsely emulsified.

2. In some instances it was transported through the lymph channels into the lymph glands.

3. In some cases it was transported by means of phagocytes.

4. In some instances the oil became tied up in the proliferating process of the cells of the pleura, soft tissues, etc., as they became thickened.

No effusion was found in any of the cases.

Chemical Report of Guy E. Youngburg, M.S.

		Specific gravity 200	Amount of oil cubic centimeters
Original oil	..	.852	..
Oil from cat	10	.852	93
	13	.852	14
	14	.852	45
	15	.852	50
	16	.852	9

The oil from the cats contained a small portion in the form of a thin emulsion, which largely separates on standing. This seemed to be an admixture of the oils with small amounts of mucinous matter, doubtless the result of the mechanical movement of the oils in contact with the mucous surfaces of the organs.

The oils had, in all probability, not dissolved any substance. This was at first indicated by the fact that there was no change in the specific gravity as there would likely have been if any substance had been dissolved by the oil.

Chemical tests for fats, lecithin, and cholesterol showed none of these present. Chemical tests for very small amounts of nitrogenous substances were found to be more difficult to make than at first anticipated. But by the procedure used there could be found nothing more than traces of any nitrogen-containing substances.

From the chemical examination, it would seem that the use of paraffin in the pleural cavity had not caused any change.

Regarding administration, I am satisfied that injecting the pleural cavity to its full capacity is a wrong method. In treating tuberculous patients I am using 50 cubic centimeters for the initial dose, and in 2 weeks I am following this by 200 cubic centimeters. At the end of another 2 weeks another 200 cubic centimeters is added. If more is considered necessary, it is given in the same ratio.

By injecting the paraffin as described, I believe the pleural cavity becomes gradually accommodated to the introduction of the oil, and the mediastinum is better stabilized. Nitrogen, I believe, can be used with greater efficiency, if the preliminary dose of 50 cubic centimeters of oil is used in the pleural cavity 2 weeks previous to administering the nitrogen.

Regarding the loss of paraffin injected, we have been able to recover from 75 per cent to 90 per cent of the totals in animals, and we believe if used in the human being at rest, the loss will be further reduced. Undoubtedly the activity of the animals must account for some of the loss.

The pneumonia which was found by the pathologist occurred in scattered patches.

The animals did not have any temperature and were clinically well, so that this is irrevelant clinically, and rather to be desired since the object of introducing the oil is to put the lung out of function.

I wish to express my appreciation for the able aid given me by Hon. Thos. B. Lockwood, Doctors J. H. Evans, E. W. Koch, B. M. Roman, R. H. Waite, H. U. Williams, B. T. Simpson, and G. E. Youngburg.

BIBLIOGRAPHY

1. KRAUSE, A. K. Am. Rev. Tuberc., 1922, June.
2. CARSON, JAMES. Essays, Physiological and Practical, 1822. Mentioned by Rivière.
3. HOUGHTON, JAMES. Dublin J. Med. & Chem. Sc., 1832.
4. MURPHY, J. B. J. Am. M. Ass., 1898, xxi, 341.
5. BRAUER, L. Muenchen. med. Wchnschr., 1906, liii, 337.
6. SACHS. J. Am. M. Ass., 1915.
7. STIVELMAN, B. New York M. J., 1921, ii.
8. MILLER, A. F. Am. Rev. Tuberc., 1921.

RARE MALFORMATION OF THE VULVA

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CATHERINE P., age 32, from Turin, Italy, a prostitute, came for treatment of an anal venereal ulcer. The history reveals nothing relative to genital or other malformation in the family. At the age of 8, while she was at the theater, she fell on a seat with her legs abducted. She remembers seeing some blood in the vulvar region. Her mother treated her and she was well after a few days. Physical examination shows the patient to be normal with lines of chest and abdomen regular and like those of a nullipara. The cervix of the uterus, the fornices, and remainder of the vaginal wall are normal, as are likewise the internal genitalia. There are no gonococci in the vaginal secretions. The Wassermann is negative, and menstruation is regular.

She does not remember having observed any change in the form of her genitalia. She makes no complaint whatever. Coitus is normal but she admits that there is a slight enlargement of the clitoris during the orgasm. She states that she is rather cold to the embraces of all her clients, and that she does not feel excessive enjoyment even with her own lover. She rarely practices masturbation. She claims to have had a woman friend before giving herself to prostitution, with whom she lived, but denies that their relations were any other than those of common friendship.

External genitalia. With the thighs slightly abducted, there is seen to extrude for about 0.5 centimeter from the anterior angle of the closed labia majora, a cutaneous formation lengthened anteroposteriorly, which ends on its posterior side. The growth resembles somewhat a preputial cowl. On gently opening the labia majora we find, on the flat vulvar region, the above described formation very marked, and extending downward for about 10 millimeters. The clitoris is normal as to form and

Fig 1.

Fig. 2.

position. It is slightly larger than normal, being enlarged about 1½ times. Anteriorly it is surrounded by a triple cowl, the superficial covering of which is formed by a slightly elevated cutaneous reflexion which fuses into the second one. The third cowl covers directly the gland and beyond this it becomes fused with the second cowl. This second cowl is thicker and rugous and extends backward, as normally, to form the origin of the labia minora. As such for a distance of 22 millimeters on the right and 30 millimeters on the left, they still resemble the normal labia minora. Beyond this, they terminate with a sharp posterior border, as if cut with scissors directed irregularly from above downward and from in front backward forming an acute angle with the vulvar region corresponding to the vestibule. In the tract corresponding to the postero-inferior margin, a cutaneous portion of the same structure about 3 millimeters wide unites, or bridges, the two margins so as to form the collar of the cowl. On separating the vulva with two fingers the normal looking glans clitoridis comes into view. Back of it there is an opening with mucus-like walls and smegma giving the impression of a preputial meatus. On lifting the portion which unites the two labia, there is an indication of a urethral canal (resembling a feminine hypospadias).

Proceeding anteroposteriorly, there is seen a vestibular area which is very smooth and devoid of any traces of a urethral meatus. Farther back there is a vaginal opening which is narrow, regularly oblong, and surrounded by very small and multiple cutaneous elevations (pseudo-terminal portion of the labia minora). On forceful opening of the vaginal introitus, there are seen the hymenal caruncles of a normal nullipara. Corresponding to the anterior angle there is indistinctly seen, better by the aid of a catheter, hidden among the hymenal caruncles, the urethral meatus. There is no trace of cicatricial tissue which might correspond to the trauma above mentioned.

This anomaly must be considered as a case of apparently rudimentary pseudo-feminine hermaphroditism. It is far from resembling the more or less marked cases of pseudo-hermaphroditism reported in the literature.

Our case did not have a clitoris of the size found in the striæ more or less developed in the androgyne. Bergh speaks of a posterior labial commissure, of a transverse fold, but he always describes a cowl so well shaped as to constitute a real masculine prepuce. In my patient there is only a bridge, a bridle uniting the posterior borders, which is not visible unless it is lifted, and is very far from forming a preputial meatus. Pozzi says that ordinarily with more or less advanced atrophy of the genital canal and hypertrophy of the clitoris, goes *pari-passu* feminine hypospadias.

In my patient the urethral canal is displaced backward so that the meatus is in the vaginal opening. The feminine type of external genitalia in the male is due to an anomaly of development; in a female the masculine type of genitalia is due to an abnormal development as a result of excess. In our case we find a slight over-development of the clitoris due to excesses, without any appreciable enlargement during erection or without other masculine characteristics, and we find too a developmental defect (rarely to be observed) of the labia minora, which are only partially normal in shape, and terminate sharply as if removed by a surgeon and become united by a weak, long and thin cutaneous flap.

In the descriptions of the shape of the labia minora in books and in case reports of pseudo-hermaphroditism of the androgynoid and gynandroid, there is always a complete absence or only a slight development of variable extent, as well as a symmetry in the formation of the labial folds, paranympheal folds (Jayle), but the labia minora always continue backward, diminishing gradually and disappearing on the side of the vaginal orifice; or there is the formation of a cowl resembling a prepuce, but only very rarely is there the brusque interruption after a normal conformation for a few centimeters so as to present the shape of a rudimentary pseudo-hermaphroditism.

Because of this, our case must be considered interesting only from the morphological side, as an anomaly of the labia and vagina (of the lower portion) caused by incomplete development, and simulating a rudimentary feminine pseudo-hermaphroditism, associated with an abnormal urethral meatus.

BIBLIOGRAPHY

BERGH. Monatschr. f. prakt. Dermatol., 1897.

JAYLE. La forme des petites lèvres. Rev. de gynéc., 1907.

MOUCHOTTE. Forme enormale des petites lèvres. Bull. Soc. anat., Par., 1900.

POZZI. Traité de gynécologie.

IDEM. Neuf cas de pseudohermafr. Rev. d. gynéc., 1911.

NIEFFEL. Traité d'anat. humaine.

TUFFIER and LAPOINTE. L'hermafrodisme. Rev. d. gynéc., 1911.

ENDOTHELIOMATA OF THE UTERUS

With Report of a Case

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THE term, endothelioma, was coined by Golgi,[1] in 1869, in describing psammoma of the dura mater, but many other pathologists have not deemed it a suitable designation. Kolaczek,[2] who made the first résumé of the subject in 1878, preferred the term angiosarcoma. Weichselbaum and Nelson,[3] the next year called it endothelial sarcoma and endothelial cancer respectively. Marchand,[4] at the same time held to the term endothelioma. Of more recent writers, Ewing,[5] classifies it among the sarcomata.

The writer thinks the original term, endothelioma, should be retained. The cells are clearly of endothelial origin. The peculiar relation which they hold with respect to the blood and lymph vessels, and the nature of growth extension at the free edge of the tumor, are sufficiently characteristic to warrant this classification.

The endotheliomata are widely distributed throughout the body, because of their origin in the vascular endothelial cells. For this reason, all tissues which contain blood or lymph vessels are potential sites of the growth.

In the female generative tract, the ovary is most frequently involved; the uterus much less frequently. In 1908, Kadegrobow,[6] reviewing the literature, unearthed 27 cases of endothelioma and perithelioma of this organ. He also found 59 cases of ovarian tumor, together with 2 cases involving the vulva and broad ligaments. These figures represent the relative frequency in the two organs. To date the author has been able to locate 48 cases, to which he is adding one more. Errors in diagnosis, lack of routine study of all pathological specimens, and lack of a settled classification, reduce the number of reportable cases very greatly.

The clinical manifestations of the disease are varied. None is pathognomonic. The chief signs are those of malignancy, which vary with the part of the organ attacked. Both the fundus and cervix are vulnerable, the latter much the more frequently. The disease is often engrafted upon a previously existing myoma, a phenomenon which has been observed by a number of writers. Whether, however, this relationship is anything but accidental, is still a question. The age of incidence is really, in all probability, the main reason for this connection between the two.

The specimens removed at the operating table present varied appearances, ordinary carcinoma and degeneration of pre-existing myomata predominating. Here again, nothing is pathognomonic. In a large number of cases the consistency is that of brain, and the specimen is pinkish-white in color, suggesting sarcoma. This resemblance is the most frequent, and the specimens simulate sarcoma more than any other condition.

The final diagnosis rests upon the microscope. Here, likewise, the picture varies. Large endothelial cells, spindle-shaped and elongated when at the periphery of the growth and more spherical when at the center, due to mutual pressure, predominate. Frequently they are grouped in nests and strands. A diagnostic feature is the peculiar relation which the cells bear to the blood and lymph vessels.

Under low power magnification, one sees a vessel with a very thick wall. This substantial support, in most of the sections observed, tends to prevent the lumen from collapsing. The wall consists of closely

[1] Il Morgagni, ii, p. 847.
[2] See Stolz: Gynaek. Rundschau, 1910, iv.
[3] See Stolz.
[4] See Stolz.
[5] Neoplastic Diseases. Philadelphia: 1919.
[6] Mittl. d. Kasenschen Universitaet, 1908, No. 5-6.

packed endothelial cells. Growth is parallel to the lumen, and no teat-like projections extend into the surrounding tissue. Very little intercellular substance is in evidence. The lumen in most cases is not invaded. The cells themselves are large, with deeply stained and slightly elongated nuclei, which fill most of the cell body. Pigment granules within the cell body, seen occasionally, demonstrate the phagocytic powers of these cells, and help confirm the diagnosis of their endothelial nature. Occasionally giant cells are observed, and mitotic figures are quite frequently found.

The exact origin of the growth is still a moot point. The endothelium and the perithelium of the blood vessels and the endothelial cells lining the perivascular lymphatics have all been considered. Mallory and Strong[1] exclude the perithelium, believing it to be too indefinite a structure, and so far having been demonstrated only in the vessels of the dura, cord, and ear. Concerning the endothelial cells of the blood and lymphatic vessels, writers seem evenly divided. Definite proof is lacking which might decide the matter. In some sections blood corpuscles are seen in the lumina, while in other sections none is visible.

Even this is not definite proof that the source of origin is one type of vessel or the other. Lazarus-Barlow thinks that the presence of blood corpuscles suggests a blood-vessel source, while a circumscribed mass of albumin, which has coagulated in the process of fixation, with the formation of débris, points to a lymphatic origin. Ewing believes that the absence of blood corpuscles is evidence of a lymphatic origin, but its presence is of less significance, since abnormal channels form between channels of the tumor and the channels of the blood vessels.

In our own specimen, no corpuscles were observed in any of the sections examined, nor was any coagulated albumin found. The lumina seen were, however, thought to be blood vessels.

The endotheliomata are, by some, subdivided according to the nature of the growth. Extension into the lumina of the vessel is termed endothelioma, while perithelioma is the term applied when the lumen remains intact and the growth is in the peripheral direction. Both have been seen in the same case by some observers. The latter are called by Lazarus-Barlow, perientheliomata. In his opinion, the velocity of the blood stream militates against the ingrowing type, while the converse is true in the lymphatic system.

The endotheliomata are extremely malignant and of rapid growth. Kadegrobow found 11 cases of metastases in 27 of the uterine tumors. Lazarus-Barlow thinks that the metastases are more frequent in this type than in any other type of growth found in this region. After observation of 22 cases he found in 15, numerous and widespread metastases.

Treatment is, as yet, unsatisfactory. Ignorance of the cause of malignancy, and our inability to recognize cases sufficiently early make a bad prognosis. The fact that the diagnosis of endothelioma has never been made clinically, further adds to the difficulty. Complete surgical removal, and the actual cautery have been the only means of treatment employed in the cases occurring in the literature. At present, with short wave length therapy at our command, it would seem that the use of radium would be the method of choice, in selected cases. Surgery, however, will no doubt continue to hold an important place in the treatment of this condition, especially where the fundus is invaded. Radium, for involvement of the cervix, will no doubt become the method of choice there.

TABLE I.—INCIDENCE OF DISEASE ACCORDING TO DECADE

	Cases
From 10 to 20 years	2
From 20 to 30 years	1
From 30 to 40 years	12
From 40 to 50 years	9
From 50 to 60 years	11
From 60 to 70 years	6
From 70 to 80 years	1

ANALYSIS OF CASES

In Table II, 48 cases were reviewed. *Age.* In 42 cases, we find that the oldest was 70, the youngest 18. There was also one case

[1] Am. J. Obst., N. Y., 1914, lxix.

TABLE II.—SUMMARY OF FORTY-EIGHT CASES FROM THE LITERATURE

Author	Age	Para	Metrorrhagia	Other Discharge	Pain	Systemic Disturbance	Previous Operations	Abdominal Tumor	Vaginal Examination	Pre-Operative Diagnosis	Treatment	Subsequent History
Amann	31	6	Last period 14 days	Yellow-white; 5 yrs.	2 mos. and backache				Tumor size of hazelnut on thickened posterior lip of cervix—not sharply circumscribed Gross: Firm, grey in color, ragged surface and fatty in appearance Microscopic: Large nucleus, fills most of cell body. Spindle-shaped cells, lack of intercellular substance	Neoplasm of portio vaginalis of cervix	Thermo-cautery	Normal healing
Barbour	62	0				Weakness	7 years previously a cervical fibroid. Polyp removed; well for 5 years	Size 7 months' pregnancy; duration 2 years	Tumor tense with smooth surface Gross: Cyst—2 pints of dark fluid	Myoma uteri plus degenerative change or pus or blood in the uterus	Supravaginal hysterectomy	
Same	51				Acute	Collapse		Size 8 months' pregnancy	Tumor elastic to touch	Hæmatometra	Supravaginal hysterectomy	Death on the 6th day—bronchopneumonia
Barbour and Watson	58	3	Yes	Watery; fœtid				Small rounded to the right side — size 5 months' pregnancy		Myoma and degeneration	Supravaginal hysterectomy	Well at end of one year
Beckhaus	43	2	6 mos.			Marked anæmia		Size 4 months' pregnancy			Hysterectomy	Metastases in few months—death in 18 months
Braetz	18	0	Yes 6 mos.						Papillary tumor 2 cm. high on posterior lip of cervix; bleeding and friable		Vaginal hysterectomy	Death in 3 weeks; metastases were suspected
Cova	35	2	Yes 6 mos.	Yellow		Slight anæmia			Fungoid tumor, size of a nut on anterior lip; spreading and friable; corpus normal size	Epithelioma of the cervix	Vaginal hysterectomy	Well at end of a year
Curtis and Vanwerts	56	4	18 mos.	18 mos. chocolate and odor	Yes			Hard mass above pubis	Tumor between bladder and uterus	Myoma and cancer of fundus	Hysterectomy	Death in 5 days; suppression of urine
Donald	25	0	6 wks.	6 wk.	Yes				Rounded swelling of the anterior lip of cervix; posterior stretched over it	Cervical fibroid	Abdominal hysterectomy	Recovery
Doran and Lockyer	49	5	6 yrs.			Emaciation and œdema of legs		Growing for 7 years	Uterus bulky and anteverted—size two fists	Large cystic tumor	Hysterectomy	Well at 4½ years

Same	36	2	6 mos.			Loss of flesh		Swelling on left side for 15 months; tumor above umbilicus; recent rapid growth	Cystic uterine fibroid rising above umbilicus	Malignant fibroid growth	Hysterectomy	Well 2 years and 7 months later
Duret	65		1 yr.		Severe lancinating to groin	Mental disturbance			Cervical polyp; friable uterus felt like a fibroma, retroflexed, size of adult fist	Fibroid and polyp	Hysterectomy	
Ewing	48		2 mos.	Foul; 2 months; pus					Uterus enlarged—tender os patulous—discharge of pus	Suppurating fibroid	Hysterectomy	Recovery
Gebhard	56	12	3 yrs.	Watery; 3 years	Cramps	Pressure on bladder			Tumor fist size in upper vagina; origin cervix	Fibroma uteri polyposum	Hysterectomy	Recovery
Gottschalk	51	1	Yes		Yes	Pressure on bladder ascites		Reaching navel; rapid growth in last 2 months		Myoma with suspected malignancy	Hysterectomy	
Graete	30	1	Yes	Watery					Cauliflower tumor size of apple on cervix	Cauliflower tumor	Vaginal hysterectomy	Death in 8 months from metastases
Grape	54	3	1 yr.	Yellow; 1 yr.					Uterus enlarged; also tumor to left of the introitus		Hysterectomy	Death
Hansen	52	3				Polyuria; dysuria; frequency; urine negative		Abdomen enlarging for 2 years	None made	Sarcoma cysticum uteri	Supravaginal hysterectomy	Death few hours from hæmorrhage
Huizinga	63	6	1 yr.						Tumor size of a hazelnut on anterior lip of cervix		Hysterectomy	Well 1 year later
Hurdon			3 wks.		9 years; bladder region				Anterior lip of cervix destroyed; posterior lip thickened; uterine body small; ex os-crater	Polyp	Hysterectomy	Death on 14th day; sepsis
Kirch-Gessener	34	3	18 mos.	Yellow and bloody; 18 mos.					Upper vagina a tumor the size of a walnut; uterus normal size	Polypoid tumor	Vaginal hysterectomy	Death 4th day; peritonitis
Kroemer	48		Yes						Hard friable tumor involving posterior lip of cervix; uterus enlarged		Hysterectomy	Death 6th day; peritonitis
Same	36	4	Yes			High grade cachexia			Uterus small; ulcerating tumor on the posterior lip of cervix	Ulcerating tumor on posterior lip of cervix	Vaginal hysterectomy	

TABLE II.—*Continued*

Author	Age	Para	Metrorrhagia	Other Discharge	Pain	Systemic Disturbance	Previous Operations	Abdominal Tumor	Vaginal Examination	Pre-Operative Diagnosis	Treatment	Subsequent History
Leith	44					Weakness, incontinence	Cyst 5 yrs. previously inoperable although attempted	Abdominal swelling since first operation		Large cystic growth	Hysterectomy	Well 6 years later
Marocco										Endocervical epithelioma		
Same										Endocervical polypoid mass of suspicious nature		
Same										Inoperable and malignant pelvic tumor		
Maunsell	40	5				Weakness		Yes—with pus discharging from sinus below umbilicus; swelling 3 months	Left appendages and uterus normal	Sloughing myoma	Hysterectomy	Well 3 years later
McFarland										Sarcoma and a degenerating fibroid	Hysterectomy	Generalized metastases in 6 weeks, death following
Pepere	70	Multipara	14 mos.	Necrotic material 2 mos.	Severe hypogastric	Loss of flesh				Submucous fibroid plus infection, gangrene or malignancy		
Same	70	Multipara		Yes	Yes	Heavy feeling in lower abdomen			Cervix long and thick; parametria infiltrated	Carcinoma of the cervix		Death
Phillips	50	0	14 mos.	Necrotic material 2 mos.	Severe hypogastric	Loss of flesh: backache		Uterus size of 4 months' pregnancy		Submucous fibroid plus infection, gangrene or malignancy	Hysterectomy	Death, embolus
Pick	52	Multipara	Yes			Anæmia	Cervical polyp		Cervical polyp	Sarcoma of fundus after curettage	Vaginal hysterectomy	
Pohorecky	34	8	2yrs.						Snoutlike tumor, size of plum on posterior lip	Carcinoma or sarcoma of the posterior lip of cervix	Vaginal hysterectomy	Well 2½ years later

										Tumor size of walnut on			Autopsy only

Rademacher	43								Tumor size of walnut on posterior lip			Autopsy only
Rimann	48	6	3 mos.	Yes	Yes				Cauliflower tumor on the posterior lip		Hysterectomy	Death 10th day
Same	36	5	3 mos.						Cauliflower growth, size of a small fist on posterior lip		Vaginal hysterectomy	Recovery
Same	67	3	Yes	Watery					Uterus slightly enlarged and fixed			
Same	31	5	2 mos.	Yes	Yes				Cauliflower growth on cervix		Vaginal hysterectomy	
Robb	62	5	Yes		3 weeks	Dull pain left leg; backache			Cervix flush with the vaginal wall; uterus fixed	Malignant disease of cervix	Cautery	Alive at end of 1 year
Sell	19	0	3 mos.	Yes		Dizzy—vomiting; in extremis						
Shaw	48		2 yrs.						Polypoid fibroma in cervix			Well 5 months later
Silberberg	64		Yes	Yes					Uterus double the normal size	Suspected carcinoma	Cautery	
Smith	38		4 mos.		Yes		2 cyst adenomata removed 2 years previously		Cervix and uterus negative		Hysterectomy	
Sperber	32	0	Yes	Yes	Yes	Headache			Tumor in cervix size of hen's egg		Hysterectomy	Recovery
Svoboda	34	3	18 mos.	Yellow					Polyp, size walnut, replacing anterior lip	Polyp	Vaginal hysterectomy	Death, peritonitis
Viana	56	3	3 yrs.	Yes					Uterus size of three months' pregnancy	Neoplasm of the corpus uteri	Vaginal hysterectomy	Recovery
Watson	58	1	1 yr.	Watery					Uterus normal size	Malignancy	Vaginal hysterectomy	Recovery followed later by squamous epithelioma
Willey			3 yrs.		6 mos.				Uterus enlarged		Hysterectomy	

TABLE III.—FURTHER DATA IN FORTY-ONE CASES FROM LITERATURE

Author	Uterine Size	Site of Growth	Size	Shape	Surface	Color	Consistency	Section	Cell Shape	Arrangement	Nuclei	Amount of Intercellular Substance	Origin-Growth	Remarks
Amann		Posterior lip of cervix (thickened)	Hazelnut	Not circumscribed sharply	Ragged	Grey yellow	Firm		Spindle polygonal	Around lymph vessels	Large	Small	Lymph spaces	
Barbour	7 months' pregnancy	Lower posterior wall	Large	Cyst	Tense-smooth	Yellow-white	(Of Wall) of fibroid	Caseous matter and fluid		Around blood vessels many of latter				
Same	8 months' pregnancy	Whole uterus	Large	Cyst	Smooth	Dark œdematous	Elastic	Purple with bright red areas plus thick chocolate fluid						
Barbour and Watson	5 months' pregnancy	Fundus	Large	Fibroid		Yellow-white	Brainlike	Hæmorrhage; necrosis		Radial about blood vessels, islands of tumor cells	Deeply stained		Lymph channels	Necrotic tissue
Beckhaus	4 months' pregnancy	General hyperplasia of uterus				Greyish red	Soft		Spindle	Closely packed around blood vessels. Cell nests		Very small	Blood vessels	Few cells free in vessel lumina
Braetz	Small	Posterior lip of cervix			Bleeding 1		Friable		Central-circular. Outer are elongated	Knots and ribbons. Cell groups have central lumina	Deep stain, large		Lymph vessels	
Cova	Normal	Anterior lip		Fungoid	Spreading		Friable	Lardaceous		Many small spaces —resembling lung				
Curtis and Vanwerts	3 coconuts				Irregular		Resembling sarcoma, friable		Polyhedral	Concentric lamelli around capillaries	Oval edge well defined		Lymph vessels	
Donald		Anterior lip		Rounded		White brown			Spindle	Alveolar				Much pigment in many cells (hæmatoidin)
Doran and Lockyer	2 fists	Walls and fundus		3 fibroids 1 cystic with pus					Small round.	Cells rise from the outer coat of blood vessels — columns and patches				
Same	Above umbilicus	Left wall and sigmoid	2½ pounds	Fibroid						Collections of cells springing from the adventitia of blood vessels				
Duret	Slightly enlarged (adult fist size)	Cervical canal												Areas of fatty degeneration
Ewing	Enlarged	Anterior wall projecting into cavity	10 by 6 cm.	Polypoid				Tumor nodules in muscle	Polyhedral	Compact	Mitotic figures			Areas of necrosis

Gebhard		Cervix—filling upper vagina	Fist	Round	Rough		Gangrenous and like fibrous polyp		Mixed tumor: connective tissue; smooth muscle; fat; cartilage; endothelium					
Gottschalk	6 months	Wall subserous	Large	Myomatous	Irregular				Polymorphic	Anastomosing columns of cells axial to blood vessels		Lacking in amount	Veins	
Graefe		Cervix	Apple	Cauliflower						Rings around lymph vessels	Deeply stained			
Grape	Enlarged	Anterior wall							Polygonal spindle	Alveoli plus central lumina	Large, clear, vesicular			
Hansen	Large abdominal tumor	Uterine wall			Irregular				Little protoplasm	Around blood vessels	Deep staining			
Huizinga		Anterior lip	Hazelnut							Groups—simulating a diffuse sarcoma			Endothelium of blood vessels	
Hurdon	Small	Anterior lip			Crater		Harder than adenocarcinoma		Cuboidal	Lunglike. Many tubules. No teat-like ingrowths		Small	Lymph spaces	Narrow zone of hyaline next to lumina of lymph spaces
Kirchgesener	Normal	Anterior lip	Walnut size	Polypoid	Irregular		Hard			Cells projecting into lumina			Lymph spaces	
Kroemer	Enlarged	Posterior lip					Hard friable		Spindle	Rings around small lymph spaces and cells in spaces		Lacking in amount	Walls of lymph vessels	
Same	Small	Posterior lip					Friable		Polymorphic	Knots — groups — and around lymph spaces				Many veins in cervix. Round-cell infiltration
Leith	Very large	Walls		Of fibroids					Irregular	Around capillaries		Small in amount		Many round cells
Marocco		Cervix								Around blood vessels. Cells in large masses.				
Same		Endocervix		Polypoid					Round, fusiform	Arborization of cells	Rich in chromatin	Lacking in amount		Degeneration
Same									Round, fusiform	Cords—alveolar arrangement	Clear			
Maunsell	Very large tumor, uterus normal	Body, right horn							Small cells	Small alveoli, masses of cells	Round			
McFarland	Enlarged	Posterior superior surface of body.	Large		Ragged					Relation to lymph spaces definite. Giant cells present				Necrosis. Hyaline degeneration

TABLE III.—*Continued*

Author	Uterine Size	Size of Growth	Size	Shape	Surface	Color	Consistency	Section	Cell Shape	Arrangement	Nuclei	Amount of Intercellular Substance	Origin—Growth	Remarks
Pepere		Cervix					Fleshy	Punctate hæmorrhages	Large, round	Alveolar—like a cyst adenoma	Large	Small amount	Lymph blood vessels occupied by groups of cells	
Phillips	4 months	Uterine cavity	Golf ball				Brainlike		Polypoid. Round spindle cells	In masses. Concentric growth about blood vessels and lymph spaces	Rich in chromatin	Small amount		
Pick	Enlarged	Uterine cavity submucosa	Egg				Firm						Endothelium of the lymph spaces and capillaries	
Pohorecky	Enlarged	Posterior lip	Plum	Snout-like	Rough, bloody		Firm	Hard greyish white lobules	Cuboidal and polygonal		Small, dark	Lacking in amount	Lymph spaces	
Rademacher		Posterior lip	Walnut				Spinal cord	Reddish white		Groups and nests. Concentric arrangement			Lymphvessels	
Rimann		Posterior lip		Cauliflower			Brain		Spindle	Concentric to lymph vessels				Many plugs of endothelial cells in veins
Same		Posterior lip	Small fist	Cauliflower		Yellow-brown	Friable		Polygonal				Lymph vessels	Many blood vessels and veins. Round cell infiltration
Same	Slightly enlarged								Large	Alveolar	Large and chromatic	Small		
Same		Cervix		Cauliflower					Spindle	Around blood vessels	Large, round, chromatic			
Robb		Cervix							Oval spindle	Masses	Many	Small		Giant cells. Many clefts
Sell	Normal	Anterior vag. wall and cervix. Close rel. to bladder					Friable				Chromatic, small		Lymphspaces	Hyaline rings
Shaw		Cervix		Polyp						Around blood vessels. Radially				

Discharge	Double normal size		Of normal uterus		Dirty grey	Firm	Point of calcification		Alveolar			Ends of blood vessels	Hyaline degeneration
Smith		Fundus				Soft, friable			Around blood vessels				Infiltration of uterine muscle
Sperber		Cervix	Pen's egg			Cartilage		Round — cuboidal, polymorphic	Blood vessels thick walls	Fill the cells	Lacking		
Svoboda	Normal	Anterior lip	Walnut	Polyp.	Irregular				Stramds, knots, alveoli, thickening of walls of lymph and blood vessels	Dark			Small round-cell infiltration
Viana	3 months					Soft, fleshy			Numerous spaces. Groups of cells	Large—oval	Lacking		
Watson	Normal	Posterior wall. Middle of body							Radial arrangement around blood vessel				Areas of necrosis
Willey	Enlarged	Uterine cavity				Fatty							

only 19. The average age was 44. From the standpoint of the decades of life, it is interesting to note that the largest number for any decade occurred between the ages 30 and 40. Of these, two-thirds occurred in the first half of that decade. This brings, then, the period of greatest frequency to a point shortly before the menopause. Table I gives the occurrence of cases according to decades.

Parity. This feature was mentioned 35 times. The greatest number of pregnancies was 12. The average was 3. Eight of the cases, or almost 25 per cent, had never been pregnant. In two additional cases multiparity was stated, but the exact number of pregnancies was not given. The number of pregnancies, then, did not seem to have any direct bearing on this condition. A strikingly large number had never been pregnant.

Metrorrhagia. This symptom occurred with greater frequency than any other. It was noted in 35 cases in a series of 42, where any mention was made of the menses or any bloody flow. This represented 83 per cent. The duration, which was noted in 28 cases, varied from 2 days to 6 years. The average was 14 months.

Leucorrhœa and discharge other than blood was mentioned in 21 cases, or 43 per cent. The duration varied from 6 weeks to 5 years. The average was 18 months. Disagreeable odor was mentioned in only 4 cases. The discharge was described as watery in 4 cases, and as yellow in 4.

Pain. This was mentioned in 16 cases, or 33 per cent. It was not constant in character or amount. The sensations described included backache, pain, and smarting around the vagina, lancinating pains in the groin, and pain in the bladder region.

Abdominal tumor. In 10 cases there was present swelling which the patient herself had noticed. In two other cases the uterus had reached the size of a 4 months' pregnancy. In one case the abdominal swelling had been increasing for 7 years. In 2 cases the enlargement had been going on for 2 years. In only 1 case had there been any recent rapid increase in growth. In one a fistulous tract had formed below the umbilicus, and was discharging pus.

General systemic disturbance. In three cases anæmia was noted. In 4 cases weakness was recorded. In 4 cases there was loss of flesh, and in one there was mental disturbance.

Vaginal examination. This was made in 38 cases. In 24 cases, or about 63 per cent, the cervix was the site of the lesion.

Pre-operative diagnoses. Definite diagnoses were made in 30 cases. In only 2 cases was the diagnosis of sarcoma made. Myoma was diagnosed 9 times; in two of these cases degeneration was noted, in two it was complicated with malignancy, and in one by suppuration. In 10 cases the condition found was malignancy of the cervical region. These represented the chief diagnoses made.

Subsequent history. This was recorded in 33 cases. Death was the result in 15 of these. Twelve deaths occurred within a month. The majority of these were from peritonitis. Three, however, died as a result of metastases. These occurred at the end of 18 months, 8 months, and 6 weeks, respectively. Ten cases were reported well at periods varying from 5 months to 6 years, the average length of time during which the cases were followed up being 2 years and 4 months.

In Table III we find the following information:

Uterine size was mentioned 31 times. It was normal in 8 cases, mentioned as very large in 8 cases and variable in size in 15 cases.

The site of the growth was mentioned in 43 cases; of these, the cervix was the seat in 25 cases, or 58 per cent. The posterior lip was mentioned as point of origin in 8 cases and the anterior lip in 7 cases. The remaining cases were involved in various other parts of the body.

The shape and size of the tumors varied greatly. They divided themselves into small, fungated growths in the cervix, and malignant degenerations of variable sized myomata.

The consistency was mentioned 26 times. It was reported as soft, or brain-like, in 9 cases and as firm in 9 other cases.

Cell shape was given in 27 cases: spindle-shaped in 10 cases; polygonal in 9; round in 4, and cuboidal in 2. In many cases the cells were described as being quite variable in shape, but the types mentioned predominated.

Arrangement of cells: This matter was discussed in 41 cases. In 9, an alveolar arrangement was noted. In 6, islands or masses of cells were described. In 7, the cells were described as being arranged radially to the lymph spaces. In 15, the arrangement was noted as being around the blood vessels. In two of these cases the cells were arranged around both the lymph spaces and blood vessels.

A lack of intercellular substance was noted in 13 cases. The origin of the growth was described as the lymph spaces in 11 cases, as the blood vessels in 4 and as both in 2.

Other special features include the presence of giant cells, hyaline degeneration, small, round-cell infiltration, areas of necrosis, the presence of pigment, fatty degeneration, an increase in the number of blood vessels in the affected part.

The following case is reported from the wards of the University Hospital, from the service of Dr. John G. Clark, to whom the writer is indebted for the privilege of presenting the case.

M. D., Gyn. No. 2150, Hosp. No. 2810, age 41, single and white, came to the hospital complaining of painful micturition, attacks of retention starting 3 years prior to admission, recently hæmaturia at the end of micturition, an unusual amount of discomfort recently with the menses.

The family history was negative. The menses began at 16, lasted 7 days and periods occurred every 28 days. They were associated with no pain and only occasionally slight leucorrhœa.

Present illness. Three years prior to admission after a day's work of heavy lifting, she developed acute retention, associated with much pain, and lasting about 10 hours. At the end of this time she had a sensation in her abdomen as though something had given way, immediately after which she passed half a chamberful of urine. Bladder irritability and frequency had preceded this attack for some time. The subsequent attacks of retention were followed by frequency, and the whole aggravated by being on her feet. This condition lasted for 3 or 4 months, when her first attack of hæmaturia came on at the end of micturition. In all she had five attacks of hæmaturia, the last two just prior to admission being very profuse. Moderate dysmenorrhœa developed during the last two or three periods.

Physical examination The patient's general condition showed nothing noteworthy except an irregular and intermittent heart action. The uterus could be felt above the symphysis, apparently covered with small nodules. *Vaginal examination*

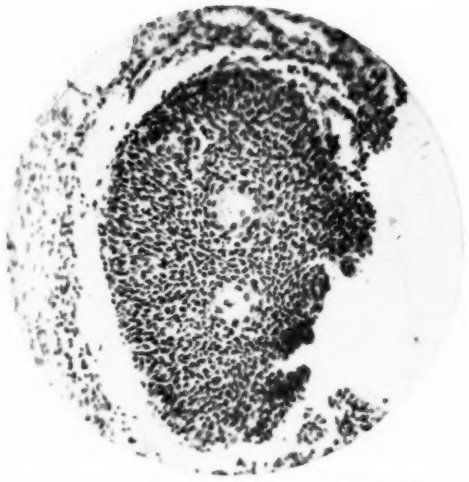

Fig. 1. Section from wall of the uterus showing the concentric arrangement of the cells around the blood vessel.

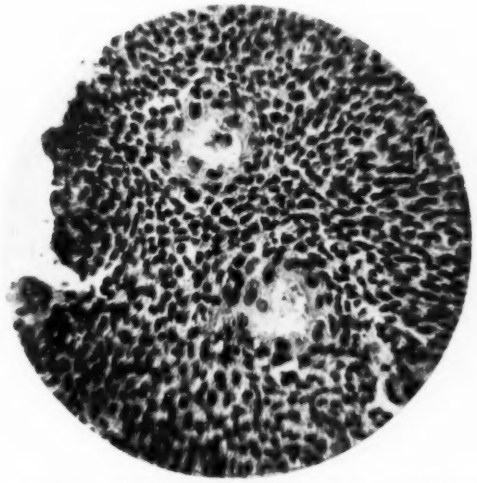

Fig. 2. Section from wall of the uterus under higher power, showing round and spindle cells.

showed a hard mass in the cul-de-sac of Douglas and encroaching on the rectum. The cervix was small, pushed to the left and contained a polypus. The uterus seemed to be retroverted, and fibrous nodules could be outlined. The mass in the cul-de-sac was very dense and extended into the right broad ligament. The urine showed much albumin and many pus cells, but no evidence of any red blood corpuscles.

Operation by Dr. John G. Clark. An intraligamentous tumor was found on the right side infiltrating the summit of the bladder. The tumor was enucleated. The bladder was resected and a suspension of the uterus performed. A clinical diagnosis was then made of a sarcomatous degeneration of a myoma. The patient died 4 days after the operation of peritonitis.

Pathological findings. Microscopically the specimen consisted of a tumor and a portion of the involved vesical wall.

The tumor was rounded in shape, with a diameter of 10 centimeters. As it came to the laboratory it showed no capsule. The surface of the neoplasm was rough, homogenous, and pinkish-white in color. It was soft and almost brain-like to the touch. On section, many cystic areas were found. Some of these were actually cysts 1 to 2 centimeters in diameter. Everywhere serum followed the knife. Some of the degenerated and cystic areas were yellowish, others dark and necrotic, while one of the largest was dark purplish-red. The tumor was very vascular and suggested a sarcoma.

Vesical portion: A small rounded lobulated portion of the tumor had penetrated the entire thickness of the bladder wall, and was present in the bladder. This tumor had a short pedicle, and was soft, purplish-red, and strongly suggested malignancy. The vesicle wall was generally thickened (1 by 1.75 centimeters), hard, and nodular to the touch, the mucosa thickened and deeply congested.

Microscopic findings. All the sections show the same general characteristics. There is a framework of very fine, delicate fibrous tissue, scattered throughout with round and spindle cells. These vary greatly in size and staining properties. The majority of these cells take the hæmatoxylin stain deeply and

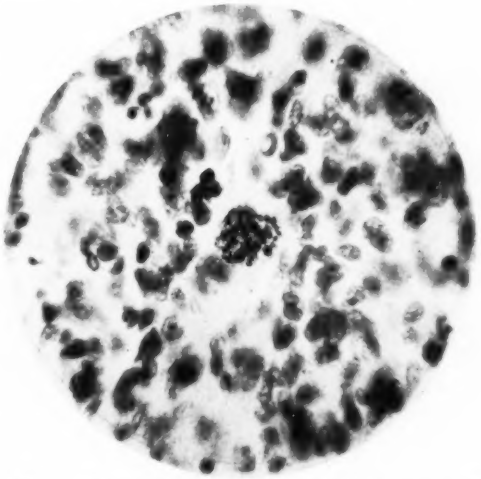

Fig. 3. Same, under oil immersion, showing presence of giant cell.

have large deeply stained nuclei. Cell division is frequently seen. A few giant cells are present. In some areas the cells are scattered indiscriminately about the field, while in others there is a distinct alveolar arrangement. In almost all of the cases, the center of the alveolus contains a blood vessel, and it is from the endothelium of these that the above-described cells take their origin. Some fields show this plainly, while in others it is less distinct. Many areas of hyaline degeneration are present. Considerable free blood is seen throughout the section. Sections from the bladder show a similar histological picture.

SUMMARY

1. The point of origin and the exact classification of the endotheliomata are still considered doubtful by many investigators.

2. The writer feels that the term is sufficient and should be used.

3. Of the female pelvic organs the ovary is most frequently the seat of growth, and the uterus is more often attacked than the literature would indicate.

4. Pre-operative clinical diagnoses have never been made.

5. The gross specimen removed at operation has no pathognomonic characteristics.

6. The diagnosis rests entirely upon the histological picture.

7. The uterine endothelioma is highly malignant and is frequently metastatic.

8. The treatment is that of malignancy.

9. The period of greatest incidence is between the ages of 30 and 40.

10. The most frequent symptom is hæmorrhage.

11. The cervix is attacked more frequently than the fundus.

12. Endotheliomatous degeneration of pre-existing myomata is not infrequent.

13. The mortality rate is high.

14. A case of endothelioma of the uterus is presented.

BIBLIOGRAPHY

AMANN. Ueber Neubildungen der Zervikal portion des Uterus. Muenchen., 1892.

BARBOUR, A. H. F. J. Obst. & Gynæc. Brit. Emp., Lond., 1913, xxiv, 61–67.

BARBOUR, A. H. F., and WATSON, B. P. J. Obst. & Gynæc. Brit. Emp., Lond., 1911, xx, 116–120.

BECKHAUS. Arch. f. path. Anat., Berl., 1907, cxc, 177–196.

BRAETZ. Arch. f. Gynaek., 1896, lii.

COVA, E. Arch. ital. di ginecol., Napoli, 1904, vii, 81–108.

CURTIS, F., and VANWERTS, J. Bull. Soc. méd. du Nord, Lille, 1913–14, p. 216–223; also Echo méd. du Nord, Lille, 1913, xvii, 380–382.

DONALD, A. J. Obst. & Gynæc. Brit. Emp., Lond., 1914, xxv, No. 1, 144.

DORAN, A. H. G., and LOCKYER, E. J. Obst. & Gynæc. Brit. Emp., Lond., 1908, xiv, 320.

DURET. Bull. Soc. anat. Chir., Lille, 1900, May; also Nord méd., 1900, June 15.

EWING, J. Proc. New York Path. Soc., 1908–09, viii, 85.

Idem. Neoplastic Diseases. Philadelphia: 1919.

GEBHARD, C. Ztschr. f. Geburtsh. u. Gynaek., Stuttgart, 1902, xlviii, 110–121.

GOLGI. Arch. f. path. Anat., etc., li, 311; also Il Morgagni, 1869, ii, 874.

GOTTSCHALK. Verhandl. d. Berl. med. Gesellsch., 1902–03, xxxiii, 141–144.

GRAEFE, M. Arch. f. Gynaek., 1904, lxxii, 373.

GRAPE. Inaugural Dissertation, Greifswald, 1897.

HANSEN, P. N. Arch. f. path. Anat., etc., Berl., clxxi, 18–34.

HUIZINGA. Zentralbl. f. Gynaek., 1904, 1632.

HURDON, E. Bull. Johns Hopkins Hosp., 1898, ix, 186.

KADEGROBOW. Mittl. d. Kasenschen Univ., 1908, No. 4–6.

KIRCHGESSENER. Ztschr. f. Geburtsh. u. Gynaek., 1903, xlix.

KROEMER. Arch. f. Geburtsh. u. Gynaek., 1902, lxv, No. 3.

LAZARUS-BARLOW, W. S. Tr. Med.-Chir. Soc., Glasgow, 1905–7, vi, 357.

LEITH, R. F. C. J. Obst. & Gynæc. Brit. Emp., Lond. 1911, April and May, 454.

MAROCCO. Arch. ital. di ginecol., Napoli, 1904, v.

MAUNSELL, R. C. B. Med. Press & Circ., Lond., 1905 lxxx, 83–85.

MCFARLAND, J. Med. News, Philadelphia, 1894, lxv, 632

PEPERE, A. Arch. ital. di ginecol., Napoli, 1903, vi 65–87.

PHILLIPS, M. H. J. Obst. & Gynæc. Brit. Emp., Lond., 1908, xiii, 103–107.

PICK. Arch. f. Gynaek., 1895, xlix and xlvi, 1.

POHORECKY, A. Arch. f. Gynaek., Berl., 1900, lx, 252–280.

RADEMACHER. Inaugural Dissertation, Wuerzburg, 1895.

RIMANN. Inaugural Dissertation, Breslau, 1902.

ROBB, H. Am. J. M. Sc., 1899, cxvii, 14–19.

SELL, G. Ztschr. f. Krebsforsch., Berl., 1914, xiv, 26–38.

SHAW, W. F. J. Obst. & Gynæc. Brit. Emp., Lond., 1914, xxiv, 197–248.

SILBERBERG, O. Arch. f. Gynaek., Berl., 1902, lxvii, 469–476.

SMITH, G. F. D. J. Obst. & Gynæc. Brit. Emp., 1908, xiv, 331.

SPERBER. Inaugural Dissertation, Leipzig, 1905.

STOLZ, A. K. Gynaek. Rundschau, Berl. u. Wien, 1910, iv, 813–828.

SVOBODA. Inaugural Dissertation, Wuerzburg, 1903.

VIANA, O. Ginecol., Firenze, 1906, iii, 481–493.

WATSON, B. P. Am. J. Obst., N. Y., 1914, lxix, 806–810.

WILLEY, F. J. Obst. & Gynæc. Brit. Emp., Lond., 1914 No. 25, 363.

SYPHILIS OF THE UTERUS AND ADNEXA[1]

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SYPHILIS of the uterus is a comparatively rare affliction, especially when one excludes the primary lesions occurring on the cervix. According to Prentiss (1) there are only 50 articles in the Surgeon General's Library up to 1914. Dr. D. S. Lamb, quoted by Prentiss, found only one specimen in the Army Medical Museum. In spite of the paucity of the literature on this subject a large variety of pathological lesions have been reported as secondary or tertiary lesions of the body of the uterus and the adnexa. The proof to substantiate the diagnosis of syphilis in these organs is, however, inadequate in most of the reported cases.

SYPHILIS OF THE CERVIX

Primary lesions. Gellhorn and Ehrenfest (2) believe that the primary lesion of the cervix is the best known and most common type of syphilitic involvement of the female internal reproductive organs. According to them, cervical chancres occur in about 1.5 per cent of all primary lesions of female genitalia, while Oppenheim, according to Frank found it to be 8 per cent and Ozenne (3) 4 to 10 per cent. This discrepancy of the frequency is attributed by Ozenne to the comparatively few examinations of the cervix in the early stages of syphilis; also to the relatively few symptoms which are produced in the patient by this lesion. An additional factor, however, is that chancres of the cervix are protected from irritation and friction, so that their course is quite rapid and the lesion produces very little necrosis or ulceration. Under usual conditions, the chancres heal quite readily and leave practically no scar as the result of their presence.

Ozenne, in reviewing the literature and his own personal cases in his recent monograph on *La Syphilis de l'Utérus et de ses Annexes*, found that the anterior lip was involved twice as frequently as the posterior and that in about half of the cases both of the lips were involved; in many cases multiple lesions occurred. He attributes the more frequent involvement of the anterior lip to the normal anteflexion and anteversion of the uterus. He divides the pathological processes in the production of the chancre into 4 stages: First, that of the incubation, of which practically nothing is known. Second, the period of onset, which occurs from 25 to 30 days subsequent to exposure; during this stage only a slight hyperæmia may be recognized. This stage also has been rarely observed. Third, the period of acme, during which the chancre assumes a definite form and appears either as an erosive, or papillary erosive process or as an ulcerating lesion. The erosive form is the usual type; in this there is a shallow, indolent lesion with moderate induration of the base and with the production of only a slight amount of secretion. The ulcerating form is very rare and may produce extensive ulceration of the entire cervix. This lesion is usually red in color and may be easily caused to bleed. There also is an associated hypertrophy of the cervix and marked induration. It is in this stage that the primary lesion of the cervix is confused with carcinoma. Adenopathy frequently occurs and may involve either the inguinal or the iliac glands. He emphasizes the point that the occurrence of enlarged inguinal glands without visible involvement of the external genitalia should arouse one's suspicion of the existence of a primary lesion of the cervix and especially so when there are associated herpetic lesions of the vulva. Fourth, the period of repair; this is usually quite rapid and leaves practically no scar. It lasts ordinarily from 3 to 4 weeks after the period of acme.

Frank (4) describes a special peculiarity of chancres of the cervix of the pregnant uterus, in that these lesions may persist up to a period of 5 months and may produce very extensive induration which may prevent spontaneous delivery of the child. Cullen (5)

[1] Presented before the Chicago Gynecological Society January 19, 1923. (For discussion see p. 99.)

emphasizes the marked induration of the base and the occasional occurrence of extensive necrosis. Liegner (6) points out that frequently our attention is attracted to the healing or healed chancre by the occurrence of secondary lesions and symptoms of early syphilis elsewhere in the body.

Secondary lesions. Ozenne believes that the secondary lesions of the cervix should be called mucous syphilides and they are usually identical with secondary lesions which involve the other mucous membranes. Fornier, according to Ozenne, found 25 cases of secondary lesions of the cervix in 522 cases of secondary lesions about the vulva. Gellhorn and Ehrenfest reported 8 cases. The latter authors divide these lesions into macules, papules, and ulcers. These forms probably represent different stages of the original macular lesions. They were able to demonstrate treponemas in practically all the various stages described.

Ozenne divides the secondary lesions into five forms: First, the erythematous form, which is usually of a red color and may involve either a part or the entire surface of the cervix and resembles an acute inflammatory lesion. Ordinarily, this type lasts for about 15 days. Second, the erosive form, in which there is a superficial erosion of variable size. The base is flattened and may have a pale red color; the lesion frequently begins as the chancre disappears. Third, a hypertrophic ulcerative form, in which the lesions first undergo a hypertrophic process, which may involve the entire cervix; the latter frequently has a violaceous color. The cervix at first is soft and slightly depressed but subsequently becomes indurated and undergoes ulceration, but with very slight production of granulations. Fourth, the papular syphilide which is the most frequent form and consists of papules of varying size. These may be multiple and they usually exhibit a tendency to coalesce. This form also may undergo ulceration. Fifth, the ulcerating syphilide, which consists from the beginning of a diffuse superficial ulceration of irregular shape with a serpiginous border.

Cullen describes the papular ulcers as being elevated above the level of the cervix and covered with a whitish or yellowish necrotic tissue. This point is also emphasized by Gellhorn and Ehrenfest as being quite characteristic of secondary syphilitic lesions of the cervix.

Tertiary lesions. Gellhorn and Ehrenfest had 6 cases of tertiary involvement of the cervix. These authors concluded that the essential lesion is a gumma which undergoes necrosis and ulceration. If the tissue proliferation predominated they considered the lesion a gumma, whereas, if retrogressive processes predominated they considered the lesion a gummatous ulcer. The cervix is usually of increased consistency and the lesions are quite firm. However, when the gummata undergo retrogressive changes they become soft and may produce a typical punched out ulcer. These ulcers usually have a yellowish appearance and may form a serosanguineous or mucopurulent exudate. During the process of healing there frequently is extensive scar formation.

Ozenne describes two forms: First, the gummatous type, which may cause diffuse gummatous infiltration involving the entire cervix and producing an irregular surface. This form is usually associated with considerable sclerosis and in some cases this process spreads to the adjacent body of the uterus. In the isolated gummata, the cervix may be studded with small solid tumors which may involve only one lip of the cervix. These may undergo dissolution and disappear or what is more frequently the case, they undergo necrosis and ulceration. Second, the sclerotic form, which may develop on pre-existing primary, secondary, or other tertiary lesions. Early, there are hypertrophic changes in the cervix, causing it to become enlarged and quite firm. This process may go on for several years but later there is atrophy and considerable fibrosis. Subsequently there may be marked stenosis of the cervical canal; when this does occur it usually gives rise to dystocia.

Cullen considers that gummata are quite rare. The tertiary ulcers that occur are usually elliptical, sharply defined, and covered with yellowish exudate.

Prentiss considers that the most common syphilitic lesion of the cervix consists of peri

vascular round-cell infiltration, arteritis, endarteritis, and fibrosis.

SUMMARY OF SYPHILIS OF THE CERVIX

Ozenne concludes that in order to make a diagnosis of syphilis of the cervix there are several essential points to be considered: First, a careful clinical history and physical examination; the latter should include the use of the speculum in order directly to observe the cervix. Second, the finding of the treponemas in the lesions. Third, the development of a positive Wassermann reaction in the blood. Fourth, the evidence of secondary lesions elsewhere in the body. Fifth, the therapeutic test, which causes the lesions to disappear under antiluetic treatment.

Gellhorn and Ehrenfest, in summarizing this variety of syphilis, include the following essential general facts: First, there is little secretion from the syphilitic lesions of the cervix, except in the tertiary ulcers or necrotic gummata. Second, there is little pain, either spontaneous or resulting from direct trauma. Third, luetic lesions of the cervix in general occur some distance from the external os, which is rarely the case with nonspecific ulcers of the cervix. Fourth, the syphilitic ulcers are usually covered by a film-like deposit, which may be wiped off easily, and exhibit a fatty lustre. These ulcers in addition are usually sharply outlined. Fifth, there is very little, if any, inflammatory reaction about the syphilitic ulcers.

SYPHILIS OF THE BODY OF THE UTERUS

Primary and secondary syphilis of the body of the uterus has been rarely observed. Norris (7) believes that the infrequency of primary lesions in this region is due to the fact that treponemas usually show a predilection for the squamous epithelium.

Tertiary lesions. Franceschini, quoted by Gellhorn and Ehrenfest, consider the varieties of tertiary syphilis under the following headings: First, syphilitic arteritis, which may cause marked arterial change, consisting either of diffuse arteritis or perivascular, round-cell infiltration. In this form, the uterus does not increase in size or shape, and hæmorrhage is frequently associated with the vascular lesions. Second, sclerosis of the myometrium, which may lead to generalized induration of the uterus with considerable proliferation of connective tissue; the latter may subsequently undergo hyalinization. Third, hypertrophy and induration of the uterus, which may cause it to become moderately enlarged and quite indurated. Fourth, atrophy of the uterus, which usually involves both the myometrium and endometrium, so that the uterus becomes a very small, hard organ.

Hoffman, according to Frank, reported a case of a woman who died 3 months postpartum in whom the endometrium was transformed into a gummatous layer several centimeters thick. Gummata were found in other organs. Askanazy (8) emphasized the fact that gummata of the uterus are frequently very atypical in that there is usually a predominance of hyperplasia of fibroblasts resulting in the production of a fibrous ground work in which, in spite of the necrosis that may occur, remnants of the pre-existing structure may be recognized. In addition, he described marked lymphocytic and plasma-cell infiltration which may be perivascular and perilymphatic in distribution. There may be diffuse infiltration of both the endometrium and myometrium with the above cells. Findley (9) concluded that syphilitic arteritis is probably the most prominent and the only evident lesion of syphilitic involvement of the uterus. This conclusion is corroborated by Gellhorn and Ehrenfest.

Ozenne describes two main types of tertiary syphilis of the uterus: First, the ulcerating gumma, which may be an infiltrating gummatous lesion in which there is diffuse infiltration of the uterus by small gummatous lesions. This causes a marked increase in the size of the uterus, sometimes approximating in size the head of a fetus. There may also occur single gummata, which ordinarily are small tumors which may undergo subsequent necrosis and softening, and produce the typical gummatous ulcer. Second, the sclerotic form in which the essential lesions are those of angiosclerosis and fibrosis of the myometrium. Morisani, quoted by Norris, believes that angiosclerosis of syphilitic origin

is quite common. McFarland (10) considers that chronic diffuse syphilitic endometritis is rather common. This opinion is also held by Norris who describes thickening of the stroma of the endometrium and changes in the glands. Gellhorn and Ehrenfest, however, conclude that the endometritis frequently seen in syphilitic women is not characteristic of syphilitic involvement.

Bordarrampé (11) had two cases which he considered as gummatous lesions of the uterus in which the Wassermann reaction was positive and the uterus returned to normal size under antiluetic treatment. According to Sosnowski (12) the tertiary lesions of syphilis of the body of the uterus frequently are confused with carcinoma involving the body of the uterus. Many authors do not believe that the simple abatement after antiluetic treatment of symptoms, such as hæmorrhage, increased size of the uterus and fibrosis, indicates syphilitic involvement of the uterus, and that the scant histological reports do not always substantiate the diagnoses.

SYPHILIS OF THE ADNEXA

There have been practically no conclusive cases in which syphilis has involved the tubes and ovaries. Gellhorn and Ehrenfest conclude that it is possible that the tubes and ovaries may become involved, but they have never seen any pathological or clinical material either in their own cases or on record to substantiate the diagnosis of syphilitic involvement. Costano (13) believes that some of the tubo-ovarian abscesses are probably of luetic origin. He, however, offers no proof to substantiate this, neither do other authors corroborate his findings. Treponemas have never been demonstrated in the acquired syphilis of the adnexa. Many lesions of the ovaries such as simple enlargement, syphilitic oophoritis, sclerosis and ovarian gummata have been described as expressions of secondary and tertiary syphilis, but Gellhorn and Ehrenfest have not found any evidence to substantiate these diagnoses.

Review of the literature leads to the conclusion that in most of the reported cases of syphilis of the body of the uterus, the evidence to establish the luetic nature of the described processes is inadequate. Typical gummatous lesions may probably be accepted without question. The reported cases of syphilis of the adnexa must be viewed with considerable skepticism. A case with early involvement of both the body of the uterus and the ovary, the nature of the lesion being established by the demonstration of the specific organism in both situations, is, therefore, considered worthy of record.

Mrs. D., age 38, entered Michael Reese Hospital on August 16, 1922, and complained of uterine bleeding. Three years before admission, the patient was curetted because of uterine bleeding. Since that time she has had one child which is 8 months old. The present attack of uterine hæmorrhage began about 2 months before admission and continued for 13 days. There was then a cessation of the bleeding for a period of 10 days. Subsequently, she has had irregular bleeding without relation to the menstrual cycle. The bleeding had at times been very profuse and has caused symptoms referable to a marked secondary anæmia. She had typhus at 8 years and smallpox at 10. There have been 11 pregnancies; 6 of the children are alive and 5 are dead. The five children that died were all of normal delivery and lived for varying ages of from 2 weeks to 18 years. The causes of death are unknown. There were no miscarriages. Menstruation began at 14, was regular and lasted 5 to 6 days. The periods, however, have been irregular since the last child. The family history is essentially negative.

The physical findings on admission revealed a moderately well nourished, white female of about 38 years of age exhibiting a marked pallor of the mucous membranes. The examination of the head, neck, thorax, and abdomen was essentially negative.

In the bimanual examination, dark fluid blood was found in the vagina. The perineum was moderately relaxed. The cervix had a bilateral laceration. The posterior lip was ulcerated and there was marked induration and thickening of the entire cervix. The surface was finely granular to palpation. The fundus was smooth, moderately enlarged and in the retroposition, but freely movable. There was moderate induration in the broad ligaments and small irregular masses were palpable to the side of the uterus. The left ovary was palpable. The direct observation of the cervix showed a mottled, irregular, ulcerated surface covered with a grayish red exudate.

The laboratory findings were those of a severe secondary anæmia. The urine contained albumin, blood cells, and pus, probably due to the admixture with the exudate from the uterine cavity.

The clinical diagnosis was carcinoma of the cervix and the case was considered operable.

A panhysterectomy was performed on August 19, 1922. The gross findings are described in the pathological report below. The patient made an uneventful recovery and left the hospital.

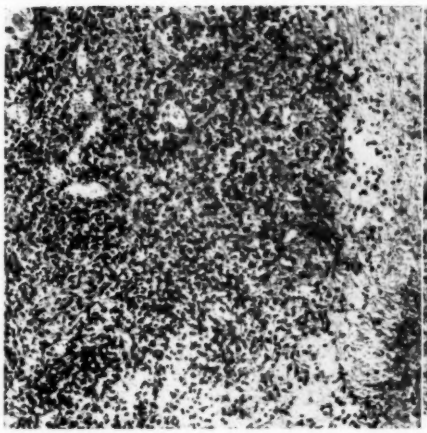

Fig. 1. Section through the cervix, showing at the right, the superficial ulceration covered by a fibrino-hæmorrhagic exudate. Beneath this layer the stroma of the cervix is found to be diffusely infiltrated with lymphocytes. There are many newly formed vessels extending throughout the section.

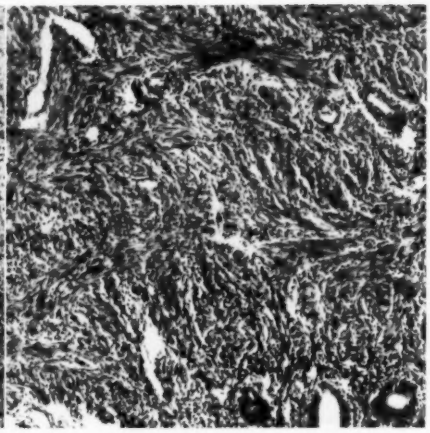

Fig. 2. Low power magnification of section through body of uterus, showing the endometrium at the bottom and the myometrium at the top. There is a diffuse infiltration of both layers with lymphocytes and plasma cells. The glands of the endometrium are somewhat hyperplastic. There is a dilated Y-shape lymphatic vessel to the left.

About 7 weeks after being admitted, the patient returned to the dispensary with very extensive secondary syphilitic lesions of the skin. A Wassermann test was made and found to be 4+ positive. Further inquiry was made about the condition of her husband and it was then found that he had had a primary lesion a few months previous.

Pathological findings. Gross examination—Uterus: The uterus was enlarged, measuring 6 by 4 by 2.5 centimeters. It was of a red color, of rather soft consistency, and very friable. The cervix was slightly indurated and had a bilateral laceration. It was thickened, and on the posterior lip there was a superficial ulceration which was covered by a red granular exudate. A bisection of the uterus revealed the uterine cavity somewhat enlarged. The endometrium was thickened, œdematous, and of a pink color. The myometrium was fibrous in character and the larger vessels displayed definite sclerosis. The perimetrium was also thickened and fibrous adhesions were attached to it.

Salpinx: The salpinx each measured about 6 by 0.4 centimeters. The fimbriated ends were patent and readily admitted a probe. The lumen was patent throughout and there was no exudate. There was some fusion of the individual folds of the mucosa.

Ovaries: The left ovary measured 4.5 by 2.5 by 1.5 centimeters. It was rather cystic to touch and bisection revealed numerous follicular cysts of varying sizes, several whitish scars and considerable fibrosis. The right ovary measured 2.5 by 1 by 0.8 centimeters and was converted into markedly fibrotic tissue.

Microscopical examination: Cervix (Fig. 1): The squamous epithelial covering was almost entirely desquamated and in its place there was a dense fibrino-hæmorrhagic exudate containing numerous lymphocytes and polymorphonuclear leucocytes. Beneath this exudate, there was a rather highly vascularized tissue containing many newly formed blood vessels. These was, in addition, a diffuse infiltration of lymphocytes and plasma cells in this region and throughout the cervical tissue. There was no definite tendency for perivascular lymphocytic infiltration.

Body of the uterus (Fig. 2): The glands of the endometrium were very markedly hyperplastic and tortuous. They were lined by a single layer of columnar epithelium. Throughout the endometrium there was a diffuse infiltration of lymphocytes and plasma cells. This cellular reaction was a very extensive process. The myometrium (Fig. 3) was diffusely infiltrated throughout with similar cells. This cellular infiltration separated the individual muscle strands but had no definite tendency to a perivascular distribution. The reaction in the myometrium was most marked immediately beneath the endometrium, but the process, however, involved the entire thickness of the myometrium. There was considerable increase of fibrous connective tissue between the muscle fibers, some of which had undergone hyalinization. The vessels in general were sclerotic, but there was no definite evidence of arteritis present.

Salpinx: There was a fusion of many of the folds of the mucosa and an increase of fibrous connective tissue of the stroma. The muscularis was slightly thickened and fibrous. The serosa was thickened and contained many newly formed blood vessels. There was no exudate in the lumen.

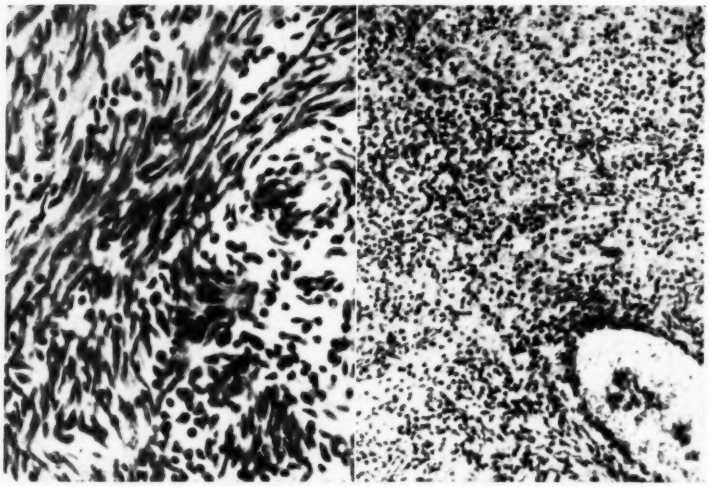

Fig. 3 (at left). High power magnification of the section through myometrium, showing the characteristic cellular infiltration. The muscle bands are separated by the lymphocytic infiltration and œdema of the interstitial tissue.

Fig. 4. Low power magnification of section through the ovary, showing diffuse infiltration with lymphocytes and plasma cells. At the top there is corpus luteum tissue in which the cellular infiltration is most marked.

Ovary: The larger left ovary (Fig. 4) contained numerous corpora albicantes and one corpus luteum. In the latter there was a central hæmorrhage, and an extensive infiltration of it by lymphocytes and plasma cells. The corpus luteum tissue itself had undergone only partial regression. The stroma elsewhere in the ovary contained a slight infiltration with lymphocytes. There was a generalized fibrosis of the ovary and a marked sclerosis of the arteries.

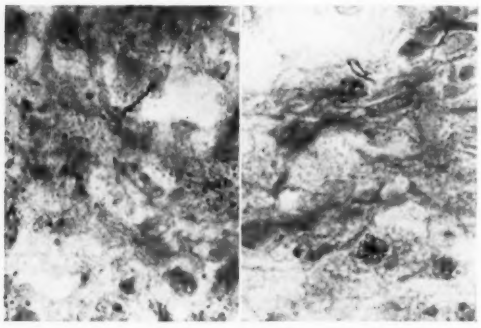

Fig. 5 (at left). Section through the myometrium stained by the Levaditi method, showing one distinct treponema in center of field and many smaller fragments throughout section. Several treponemas in field are not in focus.

Fig. 6. Section through corpus luteum of the ovary stained by the Levaditi method, showing two treponemas lying parallel to each other just above the center of the field.

The pathological diagnosis made as the result of the above findings was:

Chronic diffuse interstitial endometritis, metritis, and perimetritis;

Chronic superficial ulcerative endocervicitis;

Left cystic oophoritis;

Chronic inflammatory reaction of the corpus luteum in the left ovary;

Chronic catarrhal salpingitis and perisalpingitis.

Sections of the cervix, body of the uterus and ovaries were stained by the Levaditi method. We were able to demonstrate many treponemas throughout the cervical tissue, a considerable number in the myometrium (Fig. 5) and an occasional one in the corpus luteum of the left ovary (Fig. 6) and in the ovarian stroma.

Syphilis of the uterus, as described in the literature, produces marked variation in its pathological aspects, making it very difficult to establish definite histopathological principles for the lesions produced. Our specimen is the only one among 1366 uteri removed over a period of 13 years at Michael Reese Hospital, in which we were able to satisfy ourselves that we had a definite case which exhibited conclusive proof in establishing the diagnosis of syphilitic involvement of the uterus.

The lesion of the cervix was probably a late manifestation of a chancre and should be included in the erosive form of the early secondary lesions described by Ozenne. There was no evidence of a primary lesion of the external genitalia to cause one to conclude that a chancre was present or had involved these tissues. The glandular enlargements that were palpated in the parametrial tissues would also substantiate the presence of the chancre of the cervix.

The histological findings in the body of the uterus and ovaries brings up the question of the method of dissemination of the treponemas into these tissues. There are essentially two possibilities for this method of invasion: First, the body of the uterus and the ovary might have become infected as the result of a generalized blood invasion by the treponemas, which secondarily became localized in these two organs among many others. Second, that the process was one of lymphatic dissemination into the body of the uterus and ovaries from the chancre of the cervix. It is impossible to determine which of the above methods ensued, but we believe that the latter was the method of invasion because of the lack of definite arteritis and perivascular lymphocytic infiltration, and also because the secondary cutaneous lesions developed at a later period.

If this case is typical for early syphilitic involvement of the body of the uterus and ovaries, what may one expect in later stages? Are generalized angiosclerosis of the uterine vessels and diffuse fibrosis a terminal stage of earlier syphilitic involvement, such as was found in our case? We grant the possibility that many of the conditions described in the literature as syphilis of the uterus may be the end-result of early syphilitic involvement. But there arises at once the difficulty, as all experienced gynecologists have recognized, that changes in the vessels are quite frequent and of extreme gradation, thereby making it impossible in the uteri that have undergone many involutions subsequent to pregnancies, and in those the seat of tumors, to determine whether or not the arterial and interstitial changes are luetic or are the result of other and non-specific processes.

Syphilis of the adnexa is also very rare and the same discussion arises as to whether or not one may make the diagnosis on late findings of fibrosis and arterial changes. In our case we found diffuse lymphocytic infiltration which was most marked in the corpus luteum tissue. The more marked involvement of the latter, as compared with the rest of the ovary may be due to the rich vascular supply of corpora lutea. We believe that the conclusions given above may well represent those that one may draw for syphilis of the ovaries.

SUMMARY

Syphilis of the body of the uterus is rare. For most of the lesions which have been described as luetic, the specific character has not been definitely established and appears doubtful. Gummata have been reported; these lesions may probably be accepted as luetic, in spite of the fact that treponemas have not been demonstrated in them.

A case of early diffuse syphilitic involvement of the body of the uterus is described. The character of the process was established by the presence of the specific organism in the cellular tissue which separates the muscle bundles.

The lesion of the body was apparently secondary to a chancre of the cervix. Involvement of the body probably occurred by direct interstitial invasion from the primary lesion.

Adnexal lesions, the syphilitic character of which has been definitely proven, are even rarer than those of the body of the uterus. Chronic vascular and diffuse fibrotic processes have been reported as of luetic origin, but most of these must be excluded because of lack of evidence.

In the case reported, a corpus luteum and the surrounding stroma of the ovary were the seat of lymphocytic infiltration. Treponemas were present in this tissue, establishing the specific character of the inflammatory process.

That the involvement of the body of the uterus and of the ovary occurred early is indicated, not only by the cellular character of the inflammatory reaction, but also by the development of typical secondary cutaneous syphilides 7 weeks after the onset of the

first local symptoms. The blood Wassermann reaction was strongly positive when the skin lesions appeared. The age of the patient, a previously normal child-bearing history, vaginal bleeding, and the gross appearance of the cervix on direct visual examination led to a diagnosis of epithelioma of the cervix.

BIBLIOGRAPHY

1. Prentiss. Syphilis of the uterus. Am. J. Obst., 1916, lxxiv, 480.
2. Gellhorn and Ehrenfest. Syphilis of the internal organs of the female. Am. J. Obst., 1916, lxxiii, 864.
3. Ozenne. La syphilis de l'utérus et de ses annexes. Paris: Masson et Cie, 1920.
4. Frank. Gynecological and Obstetrical Pathology. New York: D. Appleton & Co., 1922, p. 207.
5. Cullen. Cancer of the Uterus. New York: D. Appleton & Co., 1900.
6. Liegner. Primaerafeckt an der Portio. Monatsschr. f. Geburtsh. u. Gynaek., 1921, liv, 298.
7. Norris. Syphilis of the body of the uterus. Surg., Gynec. & Obst., 1916, xxiii, 268.
8. Askanazy. Aschoff's Pathologische Anatomie. Jena: G. Fischer, 1911..
9. Findley. Diseases of Women. Philadelphia: Lea & Febiger, 1913.
10. McFarland. Textbook of Pathology.
11. Bordarrampé. Sifilis Uterina. Prensa méd. argentina, Buenos Aires, 1917–1918, iv, 319.
12. Sosnowski. Syphilis of the uterus. Surg., Gynec. & Obst., 1922, xxxv, 610.
13. Costano. La sifilis como conplicacion de los procesos gonocóccicos. Semana méd., Buenos Aires, 1919, xxvi, 704.

ATROPHY OF THE LIVER WITH NODULAR HYPERPLASIA[1]

By EUGENE H. POOL, M.D., F.A.C.S., and FRED. W. BANCROFT, M.D., F.A.C.S., New York

ACUTE or subacute atrophy of the liver is of some interest to the surgeon, first, because the symptoms occasionally lead to unnecessary and unfortunate exploratory operations, and, second, because the operative findings in such cases are likely to be wrongly interpreted. Two cases which illustrate these features are the basis of this contribution.

Acute atrophy of the liver is characterized by marked diminution in the size of the liver which often becomes reduced 50 per cent in less than 2 weeks. The etiology is obscure. The disease occurs in apparently healthy individuals as well as in those who present some acute or chronic infection. The condition has been attributed to infection, to the action of some toxin or a combination of these two. Although nothing definite is known as to the character and source of the etiological factors it is significant that similar, if not identical, lesions have been noted after the administration of salvarsan.

The symptoms develop insidiously and consist for the most part in headache; digestive disturbances, as vomiting and epigastric discomfort; jaundice; moderate fever; and later delirium, convulsions, and coma. Many cases terminate fatally in a few weeks but some persist for months. We will not dwell upon the clinical features other than to state that they usually present a picture sufficiently definite to warrant a probable diagnosis.

In what percentage of cases leucin and tyrosin are present in the urine is not known, yet the question deserves consideration since it involves a factor which may prove of diagnostic importance.

Freichs is said to have first described the presence of leucin and tyrosin in the urine in cases of liver atrophy. He believed that their presence was due to the fact that the liver, on account of its damaged condition, could not transform into urea the leucin and tyrosin absorbed from the intestinal tract.

Jacoby, in 1900, found these bodies in a case of phosphorous poisoning. He proposed the theory that their presence is due to autolysis of liver cells. This theory has been generally accepted.

Leucin and tyrosin are obtained from extracts of pancreas, spleen, thymus, lymph glands, thyroid, salivary glands, kidneys and liver. They may be found in the urine in erysipelas, enteric fever, small pox, and in obscure febrile conditions as well as in acute

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and subacute yellow atrophy. In some cases of acute yellow atrophy they have been found in the liver but not in the urine. In the type of atrophy described in this paper, they were reported present in MacCallumn's case and absent in Cayley's. If one accepts Jacoby's theory of autolysis of liver cells, the presence of leucin and tyrocin in the urine may be dependent upon the stage of the liver lesion. If degeneration is active they might be present but if regeneration is active and degeneration partially arrested they might be absent.

Since the bacillus naphthaline sulphochloride method has been used in the detection of aminoacids these bodies have been found in normal urine.

The first significant pathological change consists in fatty disintegration of the liver cells, as a result of which the liver enlarges. Rapid absorption of the products of disintegration follows with diminution in the size of the liver. The destroyed areas present only connective tissue with large numbers of tubules like small biliary ducts. Localized areas of hyperplastic tissue develop, apparently representing a compensatory reproduction of the lost hepatic parenchyma. The appearance of the organ depends upon the stage of the disease. The hyperplastic changes are noted particularly in the prolonged cases and constitute a late feature.

The lesion under consideration is of interest to the surgeon chiefly because of the great uncertainty and embarrassment which results when it is encountered at operation and not identified. The writers have each had such an experience. The liver, however, presents so characteristic a picture that the true condition should be identified.

The liver is much reduced in size; the major portion of its surface appears about normal in color, smooth, and apparently not diseased; projecting from the surface are tumor-like bosses varying in size from about 1 to 4 centimeters. These nodular excrescences suggest neoplasms and might be mistaken quite readily for carcinomatous metastases. In one of our cases they were of a congested red or bluish color; in the other yellowish when seen at operation. The liver edge is extremely sharp and acute and when palpated between the fingers gives a leathery feel. For biopsy one instinctively removes a portion of one of the apparent new-growths. This is one of the features worthy of emphasis since the seemingly normal liver substance between the nodules and not the bosses show the characteristic lesion, and it is from this normal appearing tissue that a biopsy should be made. This tissue shows absence of liver cells, that is atrophy; the bosses present the picture of hyperplasia of liver tissue. Examination of tissue from one of them does not reveal the true lesion which can only be inferred unless the adjacent liver tissue is available for study. A second feature worthy of emphasis is the wide difference in the appearance of the same organ when seen *in vitro* on the operating table and at autopsy. This factor has not received the attention it deserves. Pathologists describe the bloodless organ, the surgeon sees the organ distended with circulatory blood. We are prone, then, to expect in such unusual cases the conditions described by pathologists on the basis of examination of bloodless autopsy specimens.

The condition of nodular hyperplasia has long been recognized and was accurately described years ago. Thus, in 1895, Marchand presented a full description of the pathological findings in such a case. Meder, at the same time, discussed the origin of the hyperplasia and concluded that it originates in the interlobular bile ducts. Little emphasis, however, seems to have been placed on the condition in recent writings.

CASE 1. Woman, age 21, Russian, feathermaker, admitted December 6, 1915. Died March 30, 1916. Diagnosis: Acute (yellow) atrophy of the liver.

The patient was always strong and healthy. History negative up to 3 years before admission; since then she had "stomach trouble" which consisted chiefly in epigastric distress after eating, more especially after a heavy meal, and lasting an hour or two; not severe enough to keep her awake. Chronically constipated. Epigastric pain rarely occurred oftener than one day a week; sometimes no oftener than once a month. No vomiting. Very little nausea. No jaundice. Painful and swollen glands on left side of neck for one week, 6 months ago. Other details of history not important.

Present illness began about 2 weeks before admission with gradual yellowing of skin over body. Stomach trouble became more constant, with epigastric pain and burning, nausea, loss of appetite,

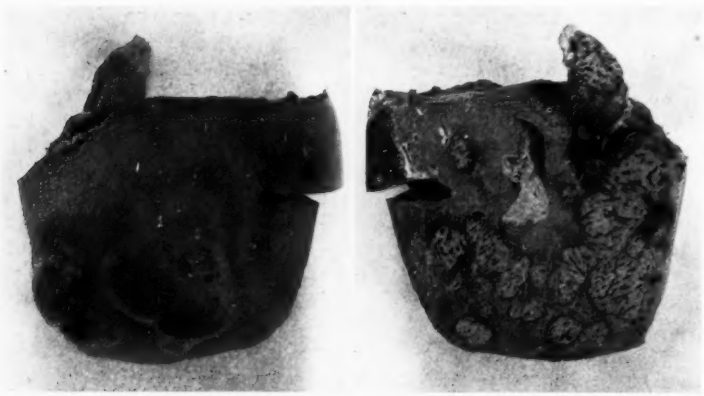

Fig. 1. Case 1. At left, gross specimen of liver; at right, cross section of same. Bosses appeared blue in color at operation; yellow at autopsy. Remainder of liver normal color but with knife-like edge.

and occasional vomiting after meals. No attacks of severe pain. Stools not observed. Severe headaches at times. Itching was severe in the second week. Nervousness and weakness since onset, but patient was able to continue working until 3 days before admission. No glandular swelling observed recently.

Physical examination on admission. Patient is a well-developed, well-nourished girl lying quietly in bed. She appears acutely ill, has no dyspnœa. The pupils are equal, regular in outline, and react normally to light and accommodation. No nystagmus, strabismus or ptosis present. Scleræ are slightly yellowish. The teeth are poorly kept; pyorrhœa present. The tongue protrudes in midline, is not tremulous nor coated. Tonsils are not enlarged nor inflamed. The pharynx is normal. The neck is not stiff nor tender. No venous engorgement or abnormal pulsations are present. The thyroid appears slightly enlarged. No tracheal tug present. On each side of neck but greater on left side, there is a swelling which on palpation proves to be several rather hard nodes. There are palpable nodes in axillæ, inguinal region, and popliteal space; the nodes, however, are not greatly enlarged. The abdomen is soft, with no tenderness, rigidity or masses. The liver edge is palpable 2 centimeters below the costal margin in the right mammillary line. The edge feels sharp and firm. No irregularities are felt. The gall bladder is not felt. The spleen edge is palpable 1 centimeter below the costal margin on deep breathing and feels firm. The kidneys are not palpable. Knee-jerks are present and equal. No pretibial œdema, scars, or thickening.

December 7, 1915, stools show no bile present.

December 15, 1915, stools show no bile, but much mucus.

January 2 to 10, 1916, coagulation time (6 tests) varied between 3 and 8 minutes.

December 8, 1915, serological examination of blood—Wassermann negative.

January 8, 1916, serological examination of spinal fluid—Wassermann negative.

	December 7, 1915	March 6, 1916
Blood count—		
White blood cells	6,800	21,000
Red blood cells	4,104,000	
	Per cent	Per cent
Hæmoglobin	80	
Polymorphonuclear neutrophiles	69	76
Polymorphonuclear basophiles	0	0
Polymorphonuclear eosinophiles	0	0
Large mononuclears	1	2
Small lymphocytes	30	21
Large lymphocytes		1

Urine examination was always about as follows: December 7, 1915, specific gravity, 1,023; acid; dark amber color; no turbidity or precipitate; faint trace albumin; no glucose. Microscopic examination showed many epithelial cells, no casts; bile +++; urobilin, +++.

Blood pressure average, 110 systolic, 70 diastolic.

For the first two weeks temperature ranged from 99 to 100. On December 24, temperature began to rise somewhat and about every third day was quite high; for instance, December 25, 103°; December 28, 102°; December 31, 104°.

Leucocytes at this time were 12,000, 66 per cent polymorphonuclears.

From January 5 to March 4, temperature ranged in general below 100°, with occasional slight rise above this. From March 4 to March 18 (date of abdominal operation), temperature became so re-

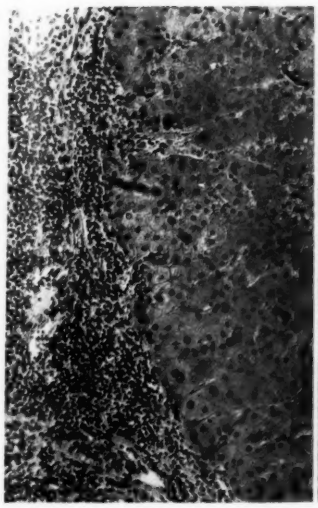

Fig. 2.

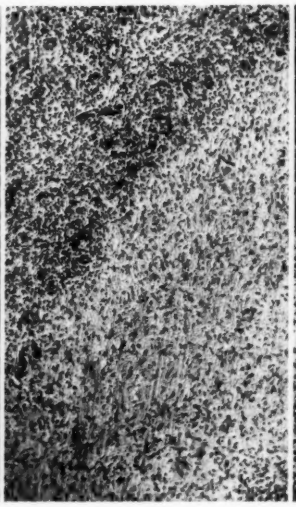

Fig. 3.

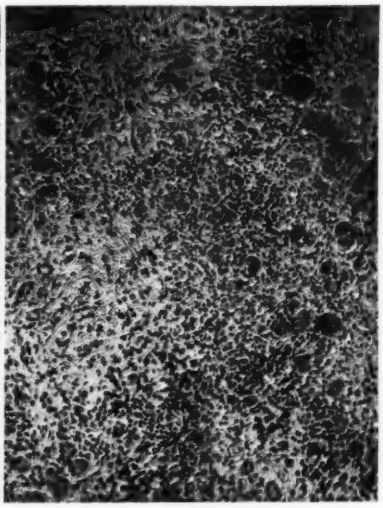

Fig. 4.

Fig. 2. Case 1. High power of border of area of nodular hyperplasia. Some liver cells showing double nuclei; marked round cell infiltration of adjacent liver tissue.

Fig. 3. Case 1. Atrophic liver. Structure of main mass of liver. Complete absence of liver cells. Section presents connective tissue (replacement fibrosis) with small round cell infiltration and some cell detritus.

Fig. 4. Case 1. Newly formed bile ducts and small round cell infiltration adjacent to area of nodular hyperplasia.

what more elevated, 102°–103° on several days, with leucocytes 20,000, 80 per cent polymorphonuclears.

January 3, 1916, supraclavicular nodes were removed for diagnosis.

Pathological diagnosis: endothelial hypoplasia of lymph nodes, no evidence of Hodgkin's disease or tuberculosis.

Aerobic and anaerobic cultures from macerated gland tissue were sterile, 7 days.

Operation. Exploratory laparotomy March 18, 1916. The gall bladder was found normal. The liver, very small and presented on all the accessible parts rounded projecting nodules about ½ inch in diameter, projecting about ¼ inch to ½ inch from the surface of the liver. These were dark blue in color. The surrounding liver was liver red. A piece of one of the projections was removed for microscopic examination, also a lymph node from the lesser curvature of the stomach. The peritoneal cavity contained about 2 quarts of thin, bloody fluid, which was removed with aspirator.

After operation the temperature remained under 100°, pulse around 92.

On the third day after operation, patient was restless, irrational, and involuntary. On the fifth day she vomited about 12 ounces of dark brown fluid. On the eleventh day she became comatose, pulse and respiration became rapid and weak; twenty-four hour specimen of urine, 17 ounces. March 29, 1916, patient was in coma all day; did not void, and was catheterized. Total urine, 12 ounces. Died. Partial autopsy showed nothing abnormal except in liver.

Pathological report as elaborated by Dr. Elser. After the operation the following material was sent to the laboratory for examination: bloody fluid from peritoneum which was cultured and proved to be sterile; two small lymph nodes from lesser curvature of stomach which showed no specific histological changes, and a small piece of tissue removed from a nodule in the liver. Microscopical examination of this material showed the microscopic features of a hyperplasia of liver cells. The lesions are regarded as compensatory in nature and strongly suggest the existence of destructive lesions elsewhere in the liver.

March 30, 1916. Autopsy specimen consisting of a portion of liver, several inches in diameter, removed after death through the laparotomy wound. The surface of the liver presents a slightly wrinkled appearance, is dark brownish red in color. The organ is leathery in consistence, and its edges are sharper than normal. Projecting from the surface for a distance of about 2 centimeters, there are two irregularly circular, rounded nodules which measure respectively 3.5 by 2.5 and 2.5 by 1.5 centimeters across, and are softer in consistence and lighter in color than the surrounding structures. On section the liver is found to contain numerous circumscribed nodules of a light greenish color. The intervening structures are dark brownish red in color and fail to show the usual lobulations of liver tissue.

Microscopic examination. Sections of the brownish red areas show the usual features of the late stages, the so-called atrophy stage, of acute yellow atrophy of the liver. The pictures presented by sections taken from different regions of these atrophic portions of the liver are not wholly identical but differ in accord with the varying degrees to which the process of repair and shrinkage has progressed in different parts of the organ. In general the sections show broad cellular bands representing the thickened and extended portions of the internal projections of Glisson's capsule and less cellular islands representing what remains of the original liver lobules. These latter regions show no cellular elements which can be identified as liver cells. They consist in the main of the original supporting structures of the liver lobules, variable amounts of débris representing the remnants of liver cells, extravasated blood, newly formed connective tissue, and blood capillaries. In addition considerable amounts of blood pigment and numerous fat granules are found scattered throughout these areas. As already indicated the differences in the size and appearance of these areas in different sections are determined by the extent to which replacement of necrotic material by young connective tissue has occurred, and the degree of shrinkage of this scar tissue which followed.

The broad bands referred to above are densely infiltrated with round cells of the lymphocyte type and are traversed by numerous channels lined with epithelial cells and having the appearance of small bile ducts. These are for the most part newly formed bile ducts and represent attempts at regeneration. Whether these regenerative efforts eventually lead to the formation of new liver lobules or remain abortive in nature is still a much disputed question. Apart from ducts which are readily identified as bile passages, there are numerous small collections of cells which approach in appearance liver cells but are considerably smaller than adult liver cells. Concerning the exact nature and origin of these collections of cells, there is considerable doubt. Some surround in an orderly manner minute canals which are filled with stagnated bile and are rendered visible because they are so distended. Other islands show no evidence of canalization, are not arranged in an orderly manner, and apart from their diminutive size suggest collections of liver cells. Whether these islands represent newly formed liver cells, and if so originate as the result of a budding process of bile ducts or from pre-existing liver cells cannot be determined without a more detailed study of serial sections. The presence of bile in some of these newly formed canals suggests that they do not communicate freely with the larger secretory ducts and may indicate that they are not at all connected with the biliary passages, but whatever the cause of the stagnation may be the presence of retained bile affords a satisfactory explanation of the obstructive nature of the jaundice in these cases.

Microscopic examination of the circumscribed nodules show them to consist of hyperplastic liver tissue. The lobules are somewhat deformed; the liver cells show irregularities in arrangement and in places evidences of unusually active proliferation approaching neoplastic proportions (marked irregularities in the size and staining peculiarities of the nuclei). Many of the liver cells contain bile pigment and in places the intralobular bile passages are plugged with bile, suggesting imperfect union with the extralobular bile ducts or partial obstruction or complete occlusion of the latter. The bile stasis indicated by the findings accounts in part for the jaundice observed in this case and also for the greenish tint of these areas noted above.

The connective-tissue stroma traversing these large islands of liver cells is infiltrated with round cells, but one misses the proliferating bile ducts which suggests that these islands originated from pre-existing liver cells.

CASE 2. Mrs. A. A., age 64 years. April 9–15, 1922. Diagnosis: Acute yellow atrophy of the liver. Chief complaint: attacks of pain in right upper quadrant; nausea and weakness. Complete hysterectomy for fibroids was done in 1911. She has had gastro-intestinal disturbances for years with nausea. The bowels are constipated. For several years she has had nocturia four to five times per night. She has had occasional attacks of pain in right lumbar region, and moderate amount of pus in urine. Six months ago patient had a bad attack of influenza and did not regain her health, her chief complaint being loss of appetite and weakness.

For the past 4 months patient has suffered from indigestion, gas after eating, and asthenia. She becomes exhausted after walking about one city block. She has had several attacks of pain in the right upper quadrant associated with nausea but no vomiting until the present attack.

Present illness began about 2 weeks before admission with gradual yellowing of skin over body. Two days before admission she was seized with violent attacks of pain in the right upper quadrant radiating to the lumbar region; marked nausea and persistent vomiting.

Physical examination on admission shows a well-nourished, elderly woman, who is up and about. Pupils are equal and react to light and accommodation. Conjunctivæ are of good color. Teeth are in good shape; no pyorrhœa. Tonsils are negative. Pharynx is normal. No enlargement of thyroid present. Heart and lungs are negative. Abdomen shows no rigidity, and no masses are felt. There is distinct localized tenderness in the region of the gall-bladder. No muscle spasm is noted nor are masses. Spleen is not felt, kidneys not felt. Vaginal examination is negative. Knee jerks are present and equal. No pretibial œdema or thickening present.

Blood examination: coagulation time, 3 minutes; white blood cells, 9,000; polymorphonuclears, 58; small lymphocytes, 20; large mononuclears, 22.

Urine examination: Specific gravity, 1,012; reaction, alkaline; albumin, very faint trace; glucose, negative; bile, negative; white blood cells, few.

Fig. 5. Case 2. Gross specimen of liver. Marked atrophy of liver with raised bosses which represent areas of newly formed liver tissue (nodular hyperplasia).

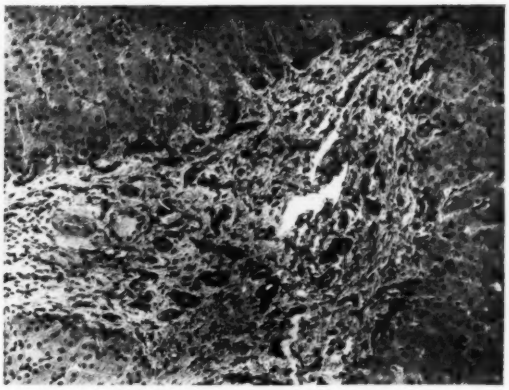

Fig. 6. Case 2. Area of nodular hyperplasia enclosing area of connective tissue containing numerous small bile ducts assumed to be newly formed.

Stools normal in color.

Wassermann, alcoholic and cholesterin, negative.

Five days after patient was admitted to the hospital, fluoroscopic examination suggested adhesions about gall-bladder and duodenum. While in the hospital the patient became definitely jaundiced.

April 15, 1922, the patient went home.

May 2, 1922, readmitted to hospital. She was worse for few days after returning home but has improved slightly during the last week. Jaundice is less than during her last admission. She has had colon irrigations q. d. but has remained obstinately constipated, constant nausea, and has had numerous fainting attacks with pronounced weakness.

May 3, 1922, operation. Upon opening the peritoneal cavity several ounces of turbid bloody fluid escaped. Liver was found to be much smaller than normal with numerous irregular, raised areas, which were yellowish gray in color and elevated about 1 to 2 centimeters above surface of the liver. Other areas of the liver were red in color but the edge was knife-like on palpation. Gall-bladder was thickened and emptied with some difficulty. There were numerous inflammatory adhesions between the gall bladder, pylorus, and stomach. These were freed. The common duct appeared about normal in size, but there was considerable œdema of the tissues about it, and there were several enlarged lymph nodes. Gall-bladder was removed. Rubber dam was inserted to the cystic duct and the wound closed in layers.

Pathological report May 6, 1922. Specimen consists of a gall bladder apparently unchanged in the gross.

Microscopical examination. The section shows a definite polymorphonuclear and round-cell interstitial infiltration of the wall.

Patient did well for three days after operation when she became drowsy and finally could not be aroused. There was rather profuse serous oozing from the wound. Reflexes were exaggerated. The abdomen was slightly distended but bowels and urine were involuntary. Temperature 100°, pulse, about 90.

Autopsy report by Dr. Elser. The description of the liver only will be given here. Diagnosis: yellow atrophy of liver; late stage with compensatory nodular focal hyperplasia.

The liver is much reduced in size. It measures approximately 15 by 20 by 6 centimeters and weighs 600 grams. The most striking feature of the organ is the presence on the surface of tumor-like projections which vary in size and form. Some are slightly raised plateau-like elevations made of closely aggregated, irregularly circular, flat projections separated by narrow, shallow depressions. These areas project about ½ centimeter above the neighboring structure. Others present a smooth, rounded surface, project from 1 to 2.5 centimeters above the surface of the organ and are irregularly circular in outline. The largest nodule of this type is situated on the upper surface of the organ just to the right of the falciform ligament. It occupies an area about the size of a silver dollar and projects above the surface for a distance of 2.5 centimeters. These nodules are bright greenish yellow in color, and in appearance suggest a glandular structure. The intervening portions of the liver present a pale grayish pink, finely granular appearance. The capsule of the liver is normal in thickness and presents a smooth surface. While the tumor-like portions are soft and friable, the remaining portions of the liver are tough and leathery in consistence. The shape of the organ apart from the irregularities produced by the projecting masses is not much altered. It presents a knife-like anterior border which measures 1 centimeter from the free margin not more than 0.5 centimeter in thickness. On section the nodules referred

to above are bright greenish yellow in color. The nodules present irregular but well-defined borders. The remainder of the cut surface of the organ is grayish pink in color with a few dark hæmorrhagic areas and the normal markings are completely obliterated. These latter areas show no definite evidences of icterus.

The picture presented is at first sight that of a neoplasm of the liver. The extreme atrophy of the organ (which could be recognized even when only a small portion of the anterior border is visible, by the marked alteration of the anterior edge) would guard against the diagnosis of a genuine new-growth of the liver.

The diagnosis at autopsy presents no difficulties. The tumefactions represent the hyperplastic remains of relatively normal liver tissue while the remainder of the organ shows the most advanced terminal stages of a process of necrosis and complete disappearance of liver cells with partial replacement by fibrous structures. These are the portions which should be selected for excision of tissue to be submitted to the pathologist for diagnosis. Tissues removed from the tumor-like areas will not enable the pathologist to make a diagnosis as to the exact nature of the disease.

Aerobic and anaerobic cultures from liver, spleen, and blood of guinea pig injected with 1.2 cubic centimeters of ground liver emulsion show growth of bacillus coli communis.

Microscopic examination of the liver shows practically the same lesions noted in connection with the preceding case. While there are minor differences such as more marked proliferation of bile ducts in the stroma of the hyperplastic portions of the organ, and fewer islands of cells resembling liver cells in the atrophic areas, these are merely quantitative differences.

CONCLUSIONS

The clinical picture in a case of acute atrophy of the liver, especially of the subacute type, should suggest the correct diagnosis. Careful examination should be made to ascertain the size of the liver. A small liver or progressive diminution in the size of the liver should confirm the diagnosis. Whether significance should be attached to the presence or absence of leucin and tyrosin is uncertain.

The operative findings of acute yellow atrophy with nodular hyperplasia are characteristic and should be identified at once. The liver is small with sharp, knife-like edge; the surface presents circumscribed elevated nodules. These represent hyperplastic liver tissue and may present a hyperæmic appearance or a yellow tint.

A section of one of the nodules does not show the characteristic lesion; therefore biopsy should include liver tissue independent of the nodule since this tissue shows the characteristic atrophy of the lesion.

REFERENCES

MARCHAND. Atrophy of liver in nodose hyperplasia. Beitr. z. path. Anat. u. z. allg. Path., 1895, xvii.
MEDER. Beitr. z. path. Anat. u. z. allg. Path., 1895, xvii.
JACOBY. Ztschr. f. physiol. Chem., 1900, xxx, 174.
WELLS, H. G. Chemical Pathology, 1907, p. 62; Arch. Int. Med 1908, i, 589.
MACCALLUM. Johns Hopkins Hosp. Rep., 1902, x, 379.
CAYLEY, W. Path. Soc. London, 1883, xxxiv, 127.

ABERRANT GASTRIC MUCOSA

Report of Two Cases—An Umbilical Polyp and a Meckel's Diverticulum[1]

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THE occurrence of gastric mucosa elsewhere than in the stomach is unusual; however, masses of cells typical of this tissue have been found at the umbilicus, in Meckel's diverticula, and in fistulous tracts which open at the umbilicus. We have been able to find 17 such cases reported in the literature. The rarity of the condition, therefore, lends sufficient importance to two recently observed cases to justify reporting them. The chief interest lies in the nature and origin of such anomalies. It is for a discussion of these problems that this paper is presented.

These problems are best approached by studying the normal development of the intestinal tract. The embryologists (23) point out that the alimentary canal develops from the splanchnopleura, which results from the fusion of the entoderm and the inner layer of the split mesoderm. Therefore, the entire alimentary tract is made up of similar cells before differentiation takes place. One of the earliest evaginations of this tube is the yolk sac and its stalk ("vitelline" or "omphalomesenteric" ducts). Its point of origin in the gut tract is used as a convenient point to divide arbitrarily the canal into the "fore" and "hind" segments. This is especially suitable, as it serves as an attachment of the gut to the ventral abdominal wall and is the pivot around which the intestines rotate in their later development (28). In the human embryo the yolk stalk and sac degenerate early (5 to 9 millimeter embryo), its function being taken by the allantois. But the ducts remain for some time longer as a fibrous strand running in the umbilical cord and from the cœliac side of the umbilicus to the intestines. Up to the 17 millimeter embryo, that part of the intestines which the vitelline duct enters lies partially in the umbilical cord. Under unexplained pathological conditions the obliteration of the yolk stalk may not be completed, so that collections of cells or groups of cells or cysts may mark the embryonic position of the duct.

A survey of the literature presents 42 such anomalies, 17 bearing gastric mucosa and the balance presenting the usual intestinal mucosa. We have not considered the innumerable instances of persistence of the proximal end of the vitelline duct (Meckel's diverticulum), and have excluded also those cases which were reported without accurate histological descriptions. The two cases following make a total of 44 cases available for study.

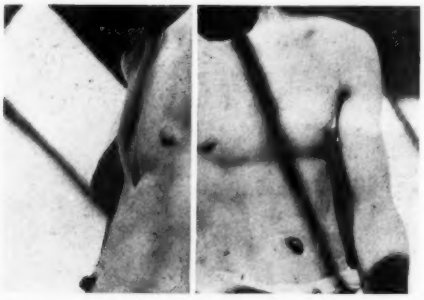
Case 1. Umbilical polyp. N. W., male, age 18, fisherman. The patient entered Dr. Grenfell's Mission Hospital at Battle Harbor on the Labrador during the summer of 1917, complaining of a tumor at the umbilicus.

The family had noted a cherry-like tumor at the umbilicus as soon as the cord dropped off. In childhood the major part of the mass had been clipped off by an itinerant doctor, but it soon grew out to its present size. The tumor had given no pain or discomfort other than that attendant on the constant soiling of the patient's clothes. The polyp had never bled or ulcerated. There had never been a discharge resembling urine or intestinal contents, although a clear fluid constantly exuded from its surface. The skin around the base of the mass had never been eczematous or ulcerated.

The patient had lost his right eye through an abscess in infancy. He had had no other illness except that during the winter of 1916 he had been one of the few survivors of an epidemic of measles which ravaged the coast. The family history is interesting in relation to a sister who had been treated in the same hospital 3 years previously. During the course of a laparotomy it had been discovered that she had a uterus unicornis and that only the left tube and ovary were present.

Physical examination. The patient was well developed and nourished. The examination was entirely negative except for the disorganized right eye and the umbilical polyp. The navicular fossa was completely filled with the protuberant mass and its border was slightly elevated so that the tumor seemed to rise from a low pedestal. The mass was 3.5 centimeters long and 1.6 centimeters in diameter at its widest part, which was near the pendulous tip (Figs. 1 and 2). There was a certain de-

[1] From the Surgical Clinic of the Peter Bent Brigham Hospital, Boston.



Figs. 1 and 2. Side and front views of Case 1, showing the umbilical polyp.

gree of pedunculation as the base was only 1.3 centimeters in diameters. The tumor was acutely flexed at its origin so that the inferior aspect lay against the abdominal wall. The surface of the tumor was covered by a brilliant crimson mucous membrane to which a glairy discharge gave a shimmering, refractive polish. No sinus could be discovered, the secretion apparently exuding from the entire surface of the growth. The amount was so small that no collection was possible; therefore, no cytological examination could be made. The odor was neither uriniferous nor fæcal. Despite the appearance of softness the tumor was very firm and its base was strongly embedded in the abdominal wall.

Operation. Three days after admission Dr. C. Samuel Curtis, in charge of the station, removed the tumor and a zone of surrounding skin by an elliptical incision. No connection was found with the bladder, intestines or liver. It was not ascertained whether or not a Meckel's diverticulum was present. Cross sections of the tumor showed a thick fibrous core covered by a thin, soft, outer layer—the mucous membrane.

Histology. The microscopic sections were stained with methylene blue and eosin. At the periphery there was a large number of secreting glands, some cut in cross section, a few longitudinally. These latter were in many cases definitely branching glands of the gastric type, showing characteristic crypt, neck and tubules (Fig. 3). With lenses of higher power it was seen that the majority of the cells lining the glands were cuboidal with basally placed nuclei and granular protoplasm. These were the only cells to be found in that part of the gland considered to be the crypt. The tubules, however, showed another type of cell. This cell was irregular, but for the most part triangular in shape. It was peripheral in position and took the acid stain. These cells were undoubtedly identical respectively with the chief and parietal cells found in the fundus of the stomach (Fig. 4).

The fibrous core of the tumor, when microscopically studied, was found to be made up of connective tissue, blood vessels, and smooth muscle fibers. Throughout this tissue, as in the mucous membrane, there were mononuclear and polymorphonuclear leucocytes, the former predominating. There was no enveloping epithelium as the glands opened on the surface of the polyp, which was covered by a homogeneous mass, probably desquamated cells and the product of the glands.

Case 2. Meckel's diverticulum. N. W., male, age 18 months, entered the Children's Hospital, Boston, June, 1915, because of pain, tumor, and pallor.

History. The family and past histories were irrelevant. No symptoms had been noted previous to the day the patient was admitted. That morning the boy had been fretful, and early in the afternoon he vomited once. Later in the afternoon when the diaper was changed, fresh blood was found unmixed with the fæces. A few minutes later the child cried out and seemed to have a sharp pain in the abdomen. He rapidly became prostrate, fell asleep and remained asleep until seen by the physician.

Physical examination. The patient was well developed and nourished. The only abnormalities to be found during a complete physical examination were marked pallor and a small movable mass about 1.5 centimeters to the left of the umbilicus. The rectal examination was negative.

Operation. The patient was immediately brought to the Children's Hospital, Boston, and the abdomen opened by a midline incision. The operator found the rectum, colon, and part of the ileum colored as though filled with blood. The ileum was followed up to a point where the character of its contents obviously changed. This corresponded to the site of a diverticulum 5 centimeters long and 2 centimeters in diameter. It was at the point where Meckel's diverticula occur. The walls of the diverticulum were œdematous, as it had been inverted, much as a glove finger may be pushed in. The diverticulum was excised and the patient made an uneventful recovery.

Histology. The incised diverticulum showed at its invaginated tip a thickened mucosa. On microscopic examination it was found that the glands in this section did not resemble the normal intestinal glands which lined the major part of the diverticulum. The sections were stained with methylene blue and eosin. The glands were mostly cut in cross section, but some of those cut longitudinally showed that the glands branched in a way typical of those of the mucosa of the gastric fundus. The most striking feature of the picture under the higher power of the microscope was cells staining a brilliant red. They were triangular in shape and were placed at the periphery of the gland. The nuclei were round and central in position. The more numerous cells were identical in staining qualities, morphology, and position with the "chief cells" described in the preceding case. In short, the tissue was identical with gastric mucosa (Figs. 5 and 6).

That the so-called Meckel's diverticulum is in reality a portion of an incompletely

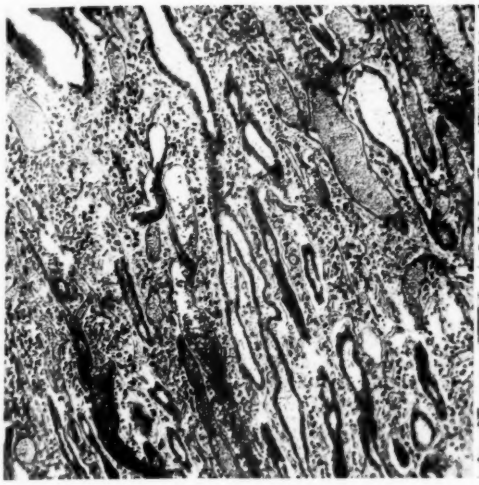


Fig. 3. Photomicrographs showing definitely branching glands of gastric type, with characteristic crypt, neck, and tubules.

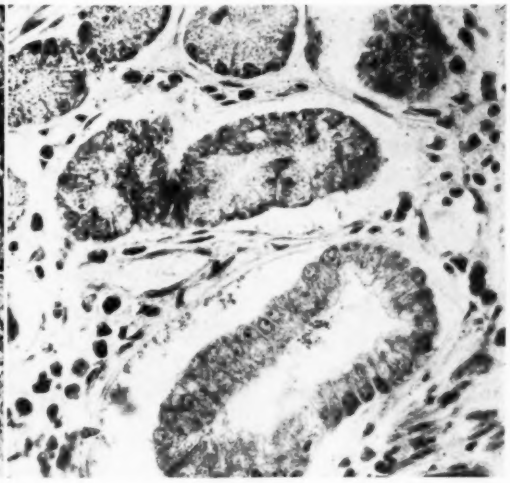
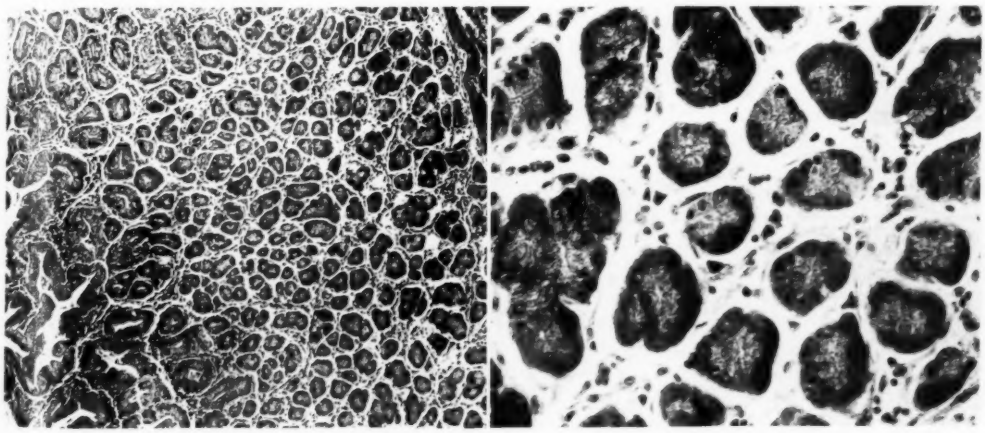


Fig. 4. High power photomicrograph showing that the majority of the cells lining the glands were cuboidal with basally placed nuclei and glandular protoplasm.

obliterated vitelline duct has long been accepted as proven. But it is less clear that some polyps at the umbilicus, which have no internal attachment, are remains of the same structure. However, there are intermediate cases which bear on this point. The discussion of the subject will be approached through this type of case.

Salzer (26) in 1904 reported a case of fistula at the umbilicus. From it came a watery discharge with a fæcal odor. It was found that the tract ran as a tube, in diameter the size of a Meckel's diverticulum, from the umbilicus to a point on the ileum at which these diverticula usually enter it, i.e., about 8 centimeters proximal to the ileocæcal valve. If the obliteration of the duct had occurred inside the abdominal wall instead of at the surface only a Meckel's diverticulum would have been found. The mucous membrane



Figs. 5 and 6. Low and high power photomicrographs, Case 2, showing cells of identically the same character as those in Case 1.

lining the tract was identical to that of the normal gastric fundus. W. H. Battle (2), C. Green (10), and Holmes (14) each report a similar case, except that in these the lining membrane was intestinal.

Denucé (6) and Lexer (20) each report a case in which a sinus discharged persistently at the umbilicus. In both cases a Meckel's diverticulum was found attached to the umbilicus by a fibrous cord, in which no lumen existed except at the skin surface. The tissue at the umbilicus was gastric mucosa. Barron (1) has recorded a case akin to these in which no lesion was found on the surface at the umbilicus; but buried deep in the abdominal wall at the umbilicus was a cyst containing gastric mucosa and continuous with the stroma around the cyst was a Meckel's diverticulum.

It is no stretch of the imagination to conceive that if the process of obliteration in the above cases had continued inside the abdomen to such an extent that even the fibrous cord or the Meckel's diverticulum had disappeared, the lesions at the umbilicus might have persisted. In this event a lesion would have resulted similar to the majority of the cases reported in the literature, where only the abnormality at the abdominal wall was found. In view of the preceding transitional cases, it is evident that these fragments of tissue are remnants of the omphalomesenteric ducts, all other portions of which have disappeared. Some 20 cases of such umbilical tumors, covered with intestinal mucosa, have been recorded. There also have been reported 4 cases similar to these, except that they had gastric mucosa on their surface.

The cases in the first group vary but little from one another. Barron (1) reports the case of a five-year-old girl who had suffered from a raised raw surface at the umbilicus from the time the cord dropped. The polyp, 5 millimeters by 9 millimeters, looked like exuberant granulation tissue; but on section showed a central core of smooth muscle and connective tissue surrounded by a zone of glands similar to intestinal mucosa. Colman (4) reported an exactly similar case in a child 2 months old, the lesion being discovered at the separation of the cord. Fox and MacLoed (7) observed in a man of 65 an eczematous patch at the umbilicus 5 centimeters in diameter, which had been forming for 11 years. The raw center passed peripherally into a circular ring of raised, brawny tissue. The sections showed modified intestinal mucosa with many degenerative cells of many types. There were practically no leucocytes, and the apparently inflamed area was made up of plasma cells. Hektoen (11) demonstrated intestinal mucosa in a small polyp at the umbilicus, which was first noted 15 years after the birth of the patient. As in most of these cases, the tubules opened on the surface of the tumor. Von Heukelom (12) reports in detail the case of an umbilical polyp 1.5 centimeters by 2 centimeters in 2½-year-old child. The outer 2 millimeters of the tumor was made up of typical intestinal mucosa. He cites twelve other cases somewhat similar to this, but fails to note the type of mucous membrane present. Hollandersky (13) presents the case of a 3-year-old boy with a pedunculated umbilical tumor, the covering of which was a mucous membrane containing Brunner's and Lieberkuhn's glands. In 1868 Holmes (14) had a patient with an umbilical tumor of intestinal origin. Holt (15) also reported a case similar to this, while Hue (16) reports five. Kirmisson (18 and 13) adds two more. Kolaczek found two in his private practice. Lunnenlonguet and Fremont (22) present three other identical cases, Lowenstein (21) adds another and Tarbox (27) completes the list with the report of a case in a girl of 12.

The cases in the second group are similar to the preceding, except that their mucous membrane is identical to gastric mucosa. In 1880 Pearce Gould (9) presented at a clinical meeting a 5-months-old infant with a pedunculated tumor springing from the cicatrix of the umbilicus. The surface of the mass was gastric mucosa, which also extended into the tumor as branched glands with a single layer of columnar epithelium. A. von Rosthorn (25) in 1889 reported the case of a 7-year-old boy who suffered from a fistula which opened on the surface of an umbilical polyp. The tract admitted a probe 2 centimeters. The passage discharged 5 cubic centimeters of fluid in 2 hours. The fluid

had an acid reaction and slowly digested albumin. Branched glands were found in the depths of the mass. They opened on the fistulous tract. Another boy 18 months old was treated by W. Roser (24) for the relief of a tumor at the umbilicus, at the tip of which a cavity 1 centimeter in diameter opened through a small duct. The secretion was similar to that in the previous case, as was the mucosa lining the cavity. Tillman (29) in 1882 had a boy of 13 years who had suffered from a pedunculated tumor the size of a walnut, which was seen as soon as the cord sloughed. After meals the tumor increased in size and in 14 minutes secreted 2 to 3 cubic centimeters of clear fluid. Chemical analysis of the secretion showed it to be identical to the gastric juice, and histological examination of the mass confirmed the analysis.

These interesting remnants present several problems, which in the present state of our knowledge are not completely answerable. What determines the persistence in some cases? How is it that the cell type in 18 of the cases should be gastric rather than intestinal? Again, why is it that in 57 per cent of the cases the glands open on the surface when they originally lined a tube?

The last of these problems is more amenable to approach than the others, and so may be attacked first. Macroscopic and microscopic examination of colostomy openings first suggested a tenable theory. During the first weeks following operation the mucous membrane of the intestine, which was at the level of the skin, prolapses and everts in all directions so that it forms a flange around the incision and projects above the level of the skin. The flange has a covering of intestinal cells, the most distal of which face outward, and as they gradually follow the arc of the pouting surface, face inward as the lumen forms to dip into the abdomen. Now, where the lumen giving rise to the everting mucous membrane is as small as in the cases of umbilical polyp, it is entirely possible that time and pressure obliterate the cells that still face each other in the uneverted lumen, and that their place be taken by the core of fibrous tissue so often present in these tumors. Even if the remnant appeared originally as a cyst in the abdominal wall, the secretion might lead to its rupture on to the skin, and the same process as described above could readily follow. So it may be suggested that the glands open on the surface as the result of a process of evagination and central necrosis and fibrosis of the cells lining the original lumen of the omphalomesenteric duct.

It is curious that the glands which open on these tumors so frequently contain gastric elements. However, the knowledge that the cells of the intestinal tract have a common origin makes their appearance understandable even if the processes by which the aberrant differentiation occurs is not known. The embryologists have long ago exploded Tillman's (29) theory that the gastric mucosa was the result of a gastric diverticulum pinched off in the umbilicus, by showing that from extremely early fetal life the liver is interposed between the stomach and the ventral wall of the abdomen. Von Heukelom (12) laid stress on the fact that in many cases where gastric mucosa is present the part which undergoes the abnormal differentiation is shut off from the gut tract very early. From this he concludes that the presence of the meconium and bile determines the characteristic cytology of the intestines, and that where they were absent the gastric type of cell developed. In refutation of this it may be pointed out that fetuses swallow their meconium and that as shown by Wislocki (30), bile is found in the stomach of chicks on the tenth day of incubation, without inhibiting the development of the gastric glands. Bensley (3), as a result of a comparative study of the cardiac glands of mammals, has suggested that their specialization is due to the mechanical effect of the food in its several phases passing through the stomach. But this does not seem applicable to a stomach which has fluid content until long after differentiation is complete.

In previous discussions a factor has been omitted which may have some bearing on the subject, although its importance is not susceptible to proof. The parts of the intestines which undergo slow quantitative growth show none of these abnormalities. The part

which develops most rapidly is the small intestine. It may be that rapid proliferation may inhibit the high degree of differentiation found in gastric or pancreatic mucosa. It is just that part of the foregut which undergoes the slowest growth, the stomach, that gastric mucosa lines. And it is at the other fixed end of the fore gut, i.e., at the site of the junction of the vitelline duct with the intestine, where growth is also comparatively slow, that high specialization is met with if a part of the duct persists. So it is at least permissible to suggest that rapidity of growth may determine the development of intestinal glands as found in the ileum, and sluggish quantitative growth may permit higher specialization.

That abnormalities are prone to occur where processes of development profoundly alter early embryonic conditions is a truism. Hence it is no more surprising to find pathological changes where a cord containing ducts, blood vessels, and stroma must be completely obliterated than to find meningoceles where the central furrow does not unite perfectly in its dorsal folding, or cystic kidneys where the two parts of the kidney meet imperfectly. But to explain why the abnormality under discussion occurs in some rather than in other persons is as difficult as in the cases of the other instances of faulty development just cited. Several prenatal conditions leading to abnormalities at the unbilicus may be suggested, but cannot properly be demonstrated until our means of studying intra-uterine life are further advanced. Traction on the cord may inhibit obliteration of the duct by stimulating continuous cell proliferation. Abnormalities of intra-uterine nutrition could conceivably produce such biological changes by reducing the energy of the fetus. These are but poor guesses, and in short this phase of the subject remains buried in the pall of ignorance that for ages has surrounded it.

CONCLUSIONS

1. Umbilical polypi bearing cells which could have developed from the splanchnopleura are remnants of the vitelline ducts.

2. The mucous membrane on the surface of these tumors may be the result of a process of evagination, central necrosis, and subsequent fibrosis of a tubular element.

3. The original cells lining the vitelline duct have the power of differentiating into any type of cell that the foregut is capable of normally developing.

4. The actual factors producing the abnormal stimulation, or lack of stimulation, for the obliteration of the vitelline duct are unknown.

BIBLIOGRAPHY

1. Barron. Surg., Gynec. & Obst., 1920, xxx, 350.
2. Battle, W. H. Tr. Clin. Soc., Lond., 1893, xxvi, 237.
3. Bensley, R. R. Am. J. Anat., 1902–03, ii, 105.
4. Colman. Tr. Lond. Path. Soc., 1888, xxxix, 422.
5. Cullen, T. S. Diseases of the Umbilicus. Philadelphia: Saunders Co., 1916.
6. Denucé. Rev. d'orthop., 1908, ix, 1.
7. Fox and MacLoed. Brit. J. Dermat., 1904, xvi, 41
8. Goetsch. E. Bull. Johns Hopkins Hosp., 1918, xxx, 143.
9. Gould. Tr. Brit. Path. Soc., 1880, xxxii, 204.
10. Green, C. Tr. Lond. Path. Soc., 1898, i, 243.
11. Hektoen. Am. J. Obst., 1893, p. 340.
12. Heukelom, Von. Nederl. Tijdschr. v. Geneesk. 1887 ii, 233.
13. Hollandersky. Zur Kasuistik der Nabeltumor.
14. Holmes. Surgical Treatment of Children's Diseases London: Longmans Co., 1868, p. 181.
15. Holt. Med. Rec., 1888, xxxiii, 431.
16. Hue, F. Normandie méd., 1906, xxi, 162.
17. Kolaczek. Arch. f. klin. Chir., 1875, xviii, 399.
18. Kirmisson. Rev. d'orthop., 1904, xxv, 47.
19. Idem. Rev. gén. de clin. et de thérap., 1907, xxi, 726.
20. Lexer. Arch. f. clin. Chir., 1898, lvii, 73.
21. Lowenstein. Arch. f. klin. Chir., 1890, p. 549.
22. Lunnenlonguet and Fremont. Arch. gén. de méd., 1884, xxxvi, 36.
23. Prentis. Textbook of Embryology, 2d ed. Philadelphia: Saunders Co., 1917.
24. Roser, W. Zentralbl. f. Chir., 1887, xiv, 260.
25. Rosthorn A., Von. Wien. klin. Wchnschr., 1889, 125.
26. Salzer. Wien. klin. Wchnschr., 1904, xvii, 614.
27. Tarbox. J. Am. M. Ass., 1917, lxviii, 965.
28. Thompson. Surg., Gynec. & Obst., 1920, xxxi, 18.
29. Tillman. Deutsche Ztschr. f. Chir., 1882, xviii, 161.
30. Wislocki, G. Personal communication.

PLACENTAL IRON AND ITS RELATIONSHIP TO ICTERUS NEONATORUM[1]

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THE incidence of jaundice in the newborn varies from 50 per cent in some clinics to 80 per cent in others. The reasons for its occurrence are varied and the question is far from being satisfactorily explained. Von Reuss (1) lists the majority of the usual theories, and to them there have been recently added three others, namely: asphyxia at the expulsive stage causing the child to inspire a certain amount of mixed vaginal secretion and amniotic fluid with the jaundice resulting from the ingestion of this infectious material (2); Deluca (3), finding in a series of five hundred and fifty-four autopsies thirty-six with meningeal hæmorrhage, believes that the icterus is due to the blood pigment from this disintegrating hæmorrhage; Luska (4) considers the jaundice due to bacteriotoxic hæmolysis, because in his cases he recovered definite organisms and found that the antistaphytoxic titer was increased.

We were especially interested in the theory that the jaundice is due to hæmolysis of fetal or maternal blood in the placenta with the pigments transmitted to the fetus, while we believe the fetal liver plays a secondary and minor rôle. If the contention be true that the maternal blood is hæmolyzed and the pigment transmitted through the placenta and if it be true that there is a destruction of fetal blood and a consequent freeing of pigment, one should be able to find an excess of iron deposited somewhere and the amount of iron deposited should correspond quite definitely to the clinical extent of the jaundice. The figures presented in this paper seem to substantiate and demonstrate that the foregoing contention is probably true. Subsequent discussion in the paper will explain how by exclusion we determined the placenta as the storage place of surplus iron.

Method of determining the iron content of placentas. The placentas, as soon as born, were perfused with water under moderate pressure through the vessels of the cord, in an attempt to get rid of as much blood as possible from the gross placental circulation. The cord and the adherent tissue was cut away and the placentas were ground up in a meat chopper. The placentas which could not be ground up as soon as delivered were kept in an icebox. The ground tissue was placed in a filter cloth and washed in running water with constant squeezing until water passing through was almost clear. This was done in order to remove all hæmoglobin. At the beginning a benzidine test for hæmoglobin was used and it was found that in most cases 20 minutes' washing was sufficient to remove practically all hæmoglobin, despite which placentas were washed 30 minutes after the benzidine test was negative.

The washed tissue in a porcelain dish was next placed in a drying oven, kept at a temperature of 100° to 105° C. for 24 hours. By this time a constant weight was obtained and the tissue was thoroughly dried.

The dried material was again ground to a fine powder and weighed to the third decimal place. (It was necessary to use a large porcelain dish at this stage for on heating in the furnace again the tissue swells and some would be lost over the sides if a small container were employed.) Five cubic centimeters of concentrated sulphuric acid with enough water to cover the tissue was added and the tissue placed in a furnace and kept there for 3 to 5 hours until a clear ash was left. The heating was carried out gradually, at a low temperature for the first hour and then slowly raised. If too great heat is applied at first the material will suddenly fuse with the container.

The cooled ash was dissolved in 25 cubic centimeters of 10 per cent hydrochloric acid and then made up to a volume of 200 cubic centimeters in a volumetric flask, an aliquot portion of this being used for the iron determinations.

[1] From the Department of Obstetrics

A colorimetric method for iron content was employed, advantage being taken of the blue color given by iron with potassium ferrocyanide.

The standard solution was made up from pure iron wire especially prepared for quantitative analysis. The standard solution was made up to contain 0.6656 milligrams of iron per 100 cubic centimeters of solution. A 10 per cent solution of potassium ferro-cyanide was added in slight excess to develop the maximum color and the colors matched in a Duboscq colorimeter.

Twenty-five cubic centimeters of the unknown iron solution were used. After the addition of the potassium ferro-cyanide when the color was developed, enough water was added to bring the intensity of the color approximately to the standard, the final dilution being noted and accounted for in the ultimate calculation.

The following formula was used for calculating results:

$$\frac{\text{Weight of dry tissue}}{200\text{ c.cm. (dilution of ash)}} \times \frac{25\text{ c. cm. (used for analysis)}}{\text{Final dilution (to color match)}} = A$$

$$\frac{\text{Reading of standard}}{\text{Reading of unknown}} \times 0.6656 = B$$

$$\frac{\text{B (milligrams of iron in 1 c.cm.)}}{\text{A (grams of placenta in 1 c.cm.)}} = \text{Milligrams of iron in one hundred grams of dry placenta.}$$

Clinical findings. The jaundice was merely observed clinically by the discoloration of the skin and such a procedure is open to criticism on the ground that in an open clinic such as one would find in a dispensary, considerable error could enter as a result of many nationalities with their own peculiar skin colorings and idiosyncrasies and also that milder cases of icterus might together escape attention. The blood determinations were made every other day and the time of taking the blood was approximately the same. The blood for counting was taken from the great toe, and there is a variation between this peripheral blood and longitudinal sinus blood due to volume, temperature, rate of flow, oxygenation and such factors. Hæmoglobin was determined according to the method of Sahli. The platelets were counted at once so as to be fresh, in a 10 per cent sodium citrate solution. The weight curves were taken directly from the clinical charts. The time of appearance and disappearance of icterus was noted as it became apparent in the skin and whenever there was a question as to whether icterus was present or not, the case was omitted from the series in an attempt to be grossly accurate clinically.

TABLE I

Case No.	Para	Sex	Jaundice Days	Term	Labor Type	Placental Iron, Mgs.
1	2	M	2–12	Yes	Spontaneous	44.93
2	3	F	None	Yes	Spontaneous	26.45
3	1	F	4–11	Yes	Difficult	34.08
4	1	M	4–10	Yes	Spontaneous	30.68
5	4	M	3–12	Yes	Spontaneous	32.09
6	1	M	None	Yes	Difficult	23.08
7	5	M	2–13	Yes	Spontaneous	33.36
8	2	M	None	Yes	Spontaneous	26.57
9	3	F	2–12	Yes	Difficult	36.92
10	1	M	2–16	Prem.	Difficult	46.17
11	2	M	3–13	Yes	Spontaneous	35.84
12	7	M	None	Yes	Spontaneous	20.50
13	1	F	None	Yes	Difficult	23.86
14	1	M	None	Yes	Difficult	19.80
15	1	F	None	Yes	Spontaneous	24.86
16	2	M	None	Yes	Spontaneous	21.26
17	1	M	2–15	Yes	Difficult	40.68
18	3	F	2–12	Yes	Spontaneous	30.13
19[1]	1	F	2–5	Yes	Spontaneous	35.79
20	7	M	None	Yes	Spontaneous	20.00
21	3	M	3–11	Yes	Spontaneous	32.34
22	2	M	None	Yes	Spontaneous	23.52
23	3	F	3–14	Yes	Spontaneous	37.16
24	2	F	None	Yes	Spontaneous	19.16
25[2]	8	M	None	Yes	Spontaneous	20.62
26	1	M	3–14	Yes	Difficult	36.93
27	3	F	3–11	Yes	Spontaneous	32.93
28	4	M	3–9	Yes	Spontaneous	28.11
29	2	F	None	Yes	Spontaneous	19.92
30	2	M	None	Yes	Spontaneous	24.78
31	3	F	3–13	Yes	Spontaneous	35.39
32[3]	4	M	None	Yes	Spontaneous	21.46
33	2	M	3–12	Yes	Spontaneous	31.82
34	1	M	None	Yes	Difficult	18.61
35	4	M	None	Yes	Spontaneous	23.90
36	2	M	2–16	Prem.	Spontaneous	47.59
37	3	F	None	Yes	Spontaneous	27.26
38	2	M	2–16	Yes	Difficult	44.85
39	4	M	3–9	Yes	Spontaneous	34.08
40	5	M	None	Yes	Spontaneous	23.21
41	1	M	None	Yes	Difficult	24.10

[1] Died—cerebral hæmorrhage.
[2] Twins—one placenta.
[3] Congenital intestinal obstruction.

From Table I it will at once be seen that the parity of the patient has no definite relationship to the jaundice nor to iron content. Fourteen males out of twenty-eight were icteric while five out of the remaining eleven females were jaundiced, so that no definite connection can be discovered so far as sex is concerned.

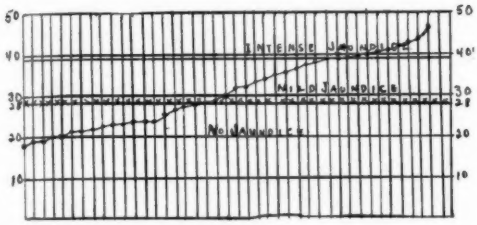

Chart 1. Each dot represents a case. Placental iron in milligrams per 100 grams dried tissue.

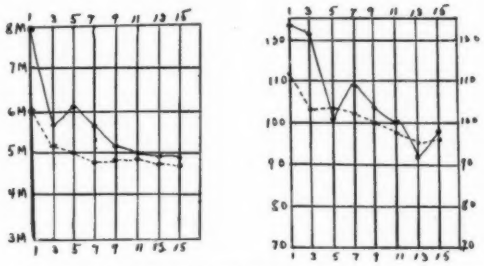

Chart 2. At left, red blood cell curve. Age of infants in days. Continuous line, non-jaundiced cases; interrupted line, jaundiced cases. At right, hæmoglobin curve. Age of infants in days. Continuous line, non-jaundiced cases; interrupted line, jaundiced cases.

The average time of the appearance of discoloration of the skin was from late in the second day until the eleventh day, while two cases persisted until the sixteenth day. Cases 10 and 36 were premature births at 7½ months, and these both had high iron content in the placenta, but it is to be observed that Cases 1, 17, and 38 were at term and they also had a high iron content. The majority of patients had easy deliveries, but Cases 26 and 41 had difficult labors, so that, if the question of asphyxia should enter actively as a factor in producing hæmolysis, we should expect to find both patients icteric, when, as a matter of fact, only one of the two was. Case 19 was a "bleeder" and cerebral symptoms were pronounced 24 hours after birth, and this is the only case that might come under the cause as given in a previous reference (3). Temperature above normal occurred in Cases 1, 7, 15, 18, 22, 27, 30, and 31, but not all these patients were consistently jaundiced. All the infants but Cases 7 and 12 were breast-fed and the evidence is not sufficient for the icterus to be attributed to artificial feeding.

Chart 1 shows graphically the apparent relationship between icterus and the placental iron content. All patients showed jaundice when the placental content was 28 milligrams and over, with a definite intensity when the content was above 31 milligrams.

Blood count. Our blood counts of red cells, white cells, and platelets correspond generally with the figures usually given for the early period of life. We were unable to detect any striking difference in count although the curve of red cells in the jaundiced cases was consistently lower than in the non-jaundiced cases, an observation noted by many others.

The hæmoglobin curves in the two groups are quite similar except that the curve in the jaundiced cases was a trifle lower throughout. The curves shown in Chart 2 graphically illustrate this matter.

Influence of weight. The following weight chart is interesting because it shows that the curve for jaundiced and non-jaundiced children is practically identical. It is a more or less accepted assertion that premature children are consistently jaundiced and also that their livers contain relatively more iron than full-term children. This series is far too small to draw any conclusion so far as weight is concerned (Chart 3).

From the tables and figures presented we are faced with two observations; namely, that certain children are jaundiced and their respective placentas contain a certain amount of iron, while beneath this amount of iron no jaundice appears, and that weight and tem-

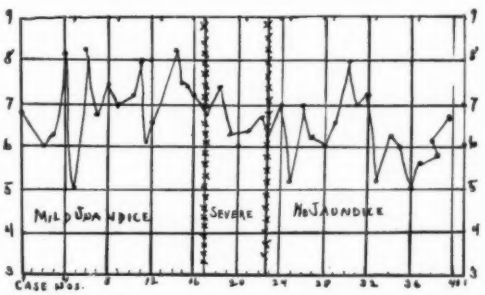

Chart 3. Showing no definite relationship between weight and appearance of jaundice. Horizontal lines indicate weight in pounds.

perature are apparently negligible factors. Stored in every newborn there is an amount of liver iron that is definitely out of proportion to that in an adult. The particular purpose of it is not certain, although it may be that Bunge is right in saying that it is to make up for the iron deficiency in maternal milk. Fetal iron can originate from but one place and that is the maternal organism, through hæmolysis of her erythrocytes or from the other forms of iron being carried in soluble form in her plasma. The manner of its actual conversion and transportation is not definitely known. All the iron that is used by the fetal organism is utilized chiefly in the blood cells and to a small extent in soluble form in the plasma, the rest being speedily eliminated by bowel and kidney. Voit (5) showed by experiments on isolated loops of intestine that the bulk of iron was eliminated by the intestinal route. This gave us a clue as to where to look for our surplus iron. Specimens of amniotic fluid were collected before the membranes had ruptured and were tested for presence of iron. The tests were either negative or gave faint traces only, the clear amniotic fluid seldom showing presence of iron. Specimens of fresh meconium were washed and tested for iron, and again we found extremely small amounts, for example, less than one-twelfth of a milligram to ten grams of meconium. Since we found that neither the fetal intestine nor kidney is actively engaged in the excretion of surplus iron, we turned to the main organ concerned in fetal excretion, namely, the placenta, and here we found iron amounts proportionate to that which one would expect to find excreted in the fæces and urine.

Wells (6) states that the pigmentation of body tissues in the jaundiced depends upon the presence in them of bile pigments which usually have been formed in the liver and then reabsorbed in the lymph and the blood stream. The chief pigment in this condition is bilirubin and it may be elaborated in the liver cells primarily. There certainly is, however, a blood pigment hæmatoidin which is chemically identical with bilirubin, and this is formed from the breaking up of hæmoglobin in the blood vessel with the removal of the iron atom. The original experiments of Minkowski and Naunyn (7) apparently show that although there was hæmolysis in all cases of jaundice, no jaundice would appear if the liver were taken out of circulation, that is, no jaundice could appear without liver action. This may be partially questioned in view of the experimental work of Hooper and Whipple (8), who showed that the intravenous injection of hæmoglobin into dogs with the liver excluded from the circulation, would cause bile pigments to appear in the urine and in the fatty tissues. Under abnormal (9) conditions hæmoglobin can be changed in the peripheral blood vessels to bilirubin without the liver playing a part, as, for example, in paroxysmal hæmoglobinuria. Many observers (10), of course, have found bilirubin or hæmatoidin in hæmorrhagic effusions where the liver could not possibly interfere. Hammerstein (11) states that following asphyxia hæmoglobin is practically the only coloring matter of the blood found in solution in the plasma, and this might apply to infants with asphyxia at the expulsive stage or where the pains were so severe and frequent as to cause a partial asphyxia.

The question has been brought up repeatedly as to whether icterus of the newborn is purely hæmolytic, hepatogenous, or a combination of both. It is commonly accepted that the liver prepares iron-free bilirubin from the hæmoglobin of the erythrocytes and either excretes or preserves the iron for future use. With increased blood hæmolysis the normal liver function is unable to cope with the increased amounts of hæmoglobin brought to it and part of it passes unchanged into the bile. The bile becomes viscid, and stagnation and absorption occur behind the sluggishly advancing stream of bile. This apparently coincides with the fact that Mensi (12) found the livers of jaundiced children three times as rich in bile as those of the non-icteric. This so-called pleiochromia (13) is brought about by the dissolution of blood cells together with a resulting catarrhal inflammation of the smaller bile ducts. We feel, however, that the whole matter can be explained as a purely hæmolytic affair with the liver playing a minor part.

The extra hæmoglobin forming the excessive amounts of bilirubin apparently comes

from the destruction of the red cells, fetal, or maternal, or both. It is a well-known fact that maternal blood as such is never directly transmitted to the fetus, so that beginning changes and hæmolysis must begin at the trophoblastic layer of the placenta. DeLee (14) states that there is a hæmolysin present in fetal blood, and this might continue the destruction of maternal blood already begun at the placental barrier, but probably the term enzyme should be used instead of hæmolysin. Another observer (15) thinks that some of the maternal blood passes into the fetus and is there hæmolyzed as a physiologic process, while the opponent (16) declares that the process takes place wholly in the placenta, with the spleen and the endothelial reticulo system continuing the destruction after birth until equilibrium has been reached. The fetal apparatus for blood regulation and manufacture is unstable at best, and the work of numerous investigators has shown the presence of nucleated reds, variation in size, and the so-called "ghosts" in the blood of the newborn, all pointing toward an instability of the blood-producing apparatus. Lichtenstein (17) declares that the increased iron found in premature babies is due to a deficiency in the blood-producing apparatus and consequently a breakdown in iron metabolism.

The curve of the red cells together with the hæmoglobin curve and their decline follows quite accurately the appearance of jaundice and its duration, or in other words with the blood hæmolysis, until equilibrium has been reached. Leuret (18) found occasional cases with hæmoglobin free in the blood plasma, and we were able to demonstrate this repeatedly. Biffi and Galli (19) found the blood plasma richer in bile pigment during the first week than at any other time.

The contention that the pigment in icterus neonatorum is largely of hæmolytic origin is further borne out by the statement of Rolleston (20) and Schiff and Farber (21), who claim to be able to distinguish chemically between bilirubin of obstructive jaundice and that of hæmolytic jaundice by means of the Ehrlich diazo reaction. In mechanical jaundice, according to this view, the bilirubin secreted by the liver cells enters the circulation as a result of obstruction and reabsorption; in dynamic or hæmolytic jaundice the bilirubin is produced by the entire reticulo endothelial system and circulates in the blood without first passing through the liver. The bilirubin of the first type gives a direct diazo reaction and the second an indirect; that is, the violet color appears only on the addition of alcohol in the latter. In all newborn children they found the bilirubin to be of the hæmolytic or dynamic type, although every patient was not necessarily jaundiced. This work has repeated in adults by Sabatini (22) and McNee (23).

We tested the jaundiced cases after the modification of Van den Bergh, (24) and we learned that accuracy in amounts used together with strictly fresh solutions, especially of the nitrite, were necessary for success. Twenty-five cubic centimeters of the sulphanilic solution was mixed with 0.75 cubic centimeter of the nitrite solution. For direct test 1 cubic centimeter of this mixture was added to 1 cubic centimeter of serum to be tested and if the jaundice was of the mechanical type the characteristic red rose color appeared. For the hæmolytic or dynamic type 1 cubic centimeter of the serum was mixed with 2 cubic centimeters of 95 per cent alcohol and the tube centrifuged until clear. To the supernatant clear fluid 0.25 cubic centimeter of the Ehrlich mixture was added and the red color, turning to violet, would appear in from 1 to 8 minutes. The striking thing, however, was that not only did we obtain the secondary test with the early jaundices but also that, when the jaundice had persisted for 8 days, during which time there should have occurred liver irritation and stasis if there was to be any, we still obtained the secondary or dynamic test reaction. We then repeated our tests on cases of known bile obstruction in adults and found the first test always appearing, as have other observers (25). This adds distinct strength to the contention that the icterus of the newborn is wholly hæmolytic.

Schiff and Farber also found bilirubin in the blood stream in all their cases. Lucas (26) and others demonstrated in the majority of the newborn of their series the presence of bilirubin in the blood stream although all were not icteric. Hirsch (27), in similar fashion,

demonstrated the presence of bilirubin in the serum of the umbilical cord, and the degree and the day of onset of jaundice was relational to the amount of bilirubin found.

Since there is little doubt that there is a surplus of bilirubin in the blood of the newborn, the question is to be answered as to where the excess of iron is deposited. Previously in this paper it has been mentioned that the meconium and amniotic fluid contain merely traces or no iron at all, thus ruling out the usual paths of excretion, namely, the kidney and the intestine. In contrast to other theories we have found definite iron amounts in the placentas, and in each instance a definite relationship between the amount present and the degree and extent of jaundice. The work of Slemmons (28) has clearly shown that at the surface of the chorionic villi, the maternal and fetal blood streams meet and exchange food-stuffs and waste products. It would seem probable that here the villi act as do the villi of the adult intestine, and thus the iron is deposited in the placenta or is transferred to the maternal blood stream for elimination. The amount of iron in the placenta would represent the amount which the fetus did not utilize and which the maternal blood stream did not eliminate through kidneys and intestine.

CONCLUSIONS

1. All newborn infants have bilirubinæmia corresponding to the iron content of the placenta.

2. There is a definite relationship between icterus neonatorum and placental iron content, the greater the placental iron content the greater the clinical jaundice.

3. Jaundice of the newborn may thus be considered as purely dynamic or hæmolytic in origin.

4. The non-icteric infants, all of whom, nevertheless, have a certain degree of bilirubinæmia, are without jaundice because their placental iron content is below the level necessary for the appearance of jaundice.

REFERENCES

1. Von Reuss. Diseases of the Newborn. New York: William Wood, 1920, p. 54.
2. Herzfeldt, T. Jahrb. f. Kinderh., Berl., 1922, xcix, 75.
3. Deluca, F. Rev. franc. de gynéc. et obst., Par., 1921, xvi, 641.
4. Luska, F. Abstracted. J. Am. M. Ass., 1922, lxxviii, 932.
5. Voit, T. Quoted in Chemistry of Food and Nutrition, H. C. Sherman. 1916, p. 236.
6. Wells, H. G. Chemical Pathology, 4th ed. 1920, p. 488.
7. Minkowski and Naunyn. Arch. f. exp. Path. u. Pharmakol., 1886, No. 21, 1.
8. Whipple and Hooper. J. Exp. Med., 1916, xxiii, 137.
9. Jones, B. B., and C. Arch. Int. Med., 1922, xxxi, 669.
10. Lephene, K. Beitr. path. Anat., 1917, No. 64, p. 55.
11. Hammerstein. Textbook Biol. Chem., 8th ed., 1916, p. 282.
12. Mensi, C. Ref. Jahrb. f. Kinderh., 1909, No. 70, 104.
13. Stadelman, T. Der Icterus und seine verschiedenen Formen, 1891, p. 234.
14. DeLee. Textbook of Obstetrics, 2d ed. 1916, p. 21.
15. Schick, B. Ztschr. f. Kinderh., Berl., 1921, xxvii, 23.
16. Wagner, C. Quoted from Schick, loc. cit.
17. Lichtenstein, S. Acta pediatrica, Stockholm, 1921, June 20, 194.
18. Leuret, F. Étude sur la pathologène de l'ictère des nouveaus-nés. Arch. de. méd. des. enf., 1905, No. 8, p. 23.
19. Biffi and Galli. Jahrb. f. Kinderh., 1908, No. 68, 204.
20. Rolleston, H. Practitioner, Lond., 1922, No. 109, 1.
21. Schiff and Farber. Jahrb. f. Kinderh., 1922, xcvii, 245.
22. Sabatini, G. Policlin., 1922, No. 29, Med. Sect. No. 10, p. 519.
23. McNee, J. W. Brit. M. J., 1921, i, 716.
24. Van den Bergh, H. Die Gefallenfarbstoff im Blute. Leipzig: Barth, 1918.
25. Lepehene, G. Deutsch. Arch. f. klin. Med., 1921, cxxxv, 76.
26. Lucas, W. P., et al. Am. J. Dis. Child., 1921, xxii, 525.
27. Hirsch, A. Quoted from von Reuss, loc. cit.
28. Slemmons. Nutrition of the Fetus. Yale Press, 1918.

TUMORS OF THE BREAST[1]

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I HAVE recently reviewed 107 cases of tumor of the breast which have come under my care. I have analyzed these cases from the clinician's point of view, and have divided them into five classes:

1. Clinically cancer. Tumor of the breast accompanied by a sufficient number of signs and symptoms to justify the diagnosis, that is, they presented those signs and symptoms which make the diagnosis unmistakable. There were 64 cases, 60 per cent, in this group.

2. Potentially cancer. Tumor or induration of the breast which is permanent, but is not accompanied by a sufficient number of signs and symptoms to justify a completed diagnosis of cancer, but having those elements which are commonly found in the precancer stage. There were 26 cases, 24 per cent in this group.

3. Doubtful cases. Tumors or indurations of the breast which are soft and of doubtful permanency unaccompanied by other signs or symptoms, but which at the same time make it imperative that the patient be under frequent observation, until they either disappear or their permanency is established. There were 13 cases, 12 per cent in this group.

4. Inoperable cases. Cases in which other organs than the breast or the glands are involved, or, in which the resistance of the patient is so reduced as to make even a palliative operation impossible. There were 4 cases, 3.5 per cent in this group.

5. Microscopical diagnosis, both primary and for confirmation. Primary microscopical diagnosis should not be undertaken except where facilities are at hand to complete it and act on its results during the operation. There were 51 cases (48 per cent) in this group. The cases in this group are also comprised in groups 1 and 2.

Of course, microscopical examination of the excised tumor, breast or glands, is always desirable as confirmatory evidence of its character.

The cases studied do not include all which have come under my observation, for the reason that my early cases were not carefully enough recorded, and some of the late cases were only seen once or twice, and the record was not sufficiently complete and uniform to be of value. Others were operated upon away from the hospital. The study points out the desirability of a uniform system of records from the beginning of one's practice.

In all the cases the method of treatment is based on the clinical diagnosis; the microscopical diagnosis has been used only to fortify the clinical diagnosis. Many recent studies of carcinoma of the breast have shown how frequently the clinical diagnosis is at variance with the microscopical. In this series 18 per cent of those reported benign by one of our best laboratories had recurrences within the first 2 years.

This study of a group of cases of tumor of the breast has been stimulated by three principal considerations:

1. A desire to know what my results have been.

2. The fact that the teaching regarding the diagnosis of cancer of the breast in our medical schools is not always in harmony with the best of the most recent developments on the subject. As an examiner in surgery of candidates for license in Illinois, I found that fully 90 per cent of all the candidates, whether recent or old graduates, failed to answer in a satisfactory manner the question "Describe an *early* case of cancer of the breast, and outline treatment." In fact they showed plainly that they had not been taught the signs and symptoms of early cancer, not to say anything of potential cancer. Pain, retracted nipple, dimpling, enlarged glands, immobility of mass, or emaciation, were to be found in 90 per cent of the answers, yet these are all admittedly late signs and symptoms. The only conclusion is that the teaching in our schools does not place sufficient emphasis on early and potential cancer.

[1] Read before the Western Surgical Association, St. Louis, Missouri, December 1, 1921.

3. Much of our book literature, even some which is quite recent, is not in harmony with the latest developments of the subject. For example, a recent work on surgical diagnosis contains a scant four pages on "Neoplasms of the Breast," and does not contain a suggestion of the impossibility of arriving at an early differential diagnosis. The author does not call attention to the fact that benign neoplasms quite frequently prove to be malignant, and that all neoplasms of the breast must be regarded with great suspicion. One would be led to think that the differential diagnosis consisted in following out a simple set of rules as to the hardness, mobility, etc., of the growth.

A study of some recent books will reveal the frequent use of such loose expressions as "generally," "as a rule," "usually," "more frequently," "early enlargement in the axilla," "pain as an early and marked symptom," "early cachexia." Such expressions in dealing with this disease are, to put it mildly, pernicious, and do not help the reader to arrive at a proper conception of the subject. A common fault is that there is so little attempt to differentiate early from late cases, and often no suggestion that a so-called benign growth may speedily become malignant, or in fact may already be malignant although all clinical signs favor a diagnosis of benign tumor. A number of authors fail to point out the great difficulty in arriving at a diagnosis, and the numerous sources and causes of error. They fail to bear down upon the fact that tumors of the breast may contain elements of malignancy which are impossible to diagnosticate. One cannot analyze a group of cases without being confronted frequently with the fact that a tumor, which by all the older rules of diagnosis was believed to be benign, has unexpectedly proved to be malignant. Authors have not been sufficiently insistent on the fact that the patient's life is staked on an early diagnosis.

The following observations and deductions seem to be justified by this clinical study as well as from a study of the latest and best literature of the subject.

In dealing with this subject it should be a maxim that all benign tumors of the breast may become malignant, and that some tumors which seem to be benign may already be malignant. My statistics show plainly that if this policy could always have been faithfully followed, several secondary operations would have been avoided and several lives saved. A careful study of benign tumors shows that each one in turn has frequent exceptions when it is found to be malignant (8).

When we come to consider treatment of tumors of the breast it is nothing short of a surgical crime to await an accurate pathological diagnosis. Some of the commonest diseases of the breast may lay the foundation for malignancy, and there is no way in which we can tell whether or not in a given case malignancy has already taken place. Chronic interstitial mastitis is often confused with carcinoma. In fact it seems to be well established that malignancy may occasionally give rise to chronic mastitis (5). Chronic cystic mastitis is an even more dangerous condition, and breasts which are clinically described as cystic should always be regarded as dangerous, as malignancy may already be present (5). Cysts of the breast are commonly of duct origin, and the ducts may already contain the beginnings of malignancy. The smallest and most freely movable adenomata may prove the starting point for a rapidly growing cancer (2).

Metastasis has been known to take place notwithstanding the fact that the microscope reported a non-malignant fibro-adenoma. In my own cases 18 per cent that were pronounced benign by one of our best laboratories had recurrences. This is not a criticism of the laboratory but emphasizes the difficulties of diagnosis. The time has come when we must admit that a positive clinical diagnosis of cancer of the breast cannot be made sufficiently early to justify using it as a basis for surgical treatment. How are we to say that a given growth which is clinically benign does not already contain elements of malignancy? A growth which is benign this month may be malignant next, or more likely already contains elements of malignancy (13).

Much effort has been spent, by some authors, to make a differential diagnosis between

benign and malignant growths, and the following quotation from a well-known author well describes the futility of the effort.

"If the tumor (breast) has only been present a matter of months it is probably cancer, if a year or more it is fibro-adenoma. Further fibro-adenoma not rarely undergoes cancerous changes, and this alteration is not signified by any recognizable clinical symptoms" (13).

We cannot rely upon time, as a principal element in arriving at a differential diagnosis. Carcinoma may originate in a breast and be present for years without giving rise to a palpable tumor (11).

Is it not a situation where we are driven to the conclusion that all benign tumors of the breast should be removed? For the very good reason that a positive differential diagnosis is impossible (10). Instead of elaborate efforts at differential diagnosis would it not be better to adopt the maxim that "Any lump in a woman's breast is better out than in?" (10).

The onset of cancer of the breast is so insidious that we have little to guide us in its early stages except the presence of a growth. Usually the patient feels no pain but simply discovers a lump in the breast accidentally. There is no accurate way to know how long it has been in the breast (12). We may be able to make a positive diagnosis of a benign nodule in a breast and the microscope may reveal a cancerous development at a distance in a duct (9). A recent author suggests that no benign tumor of the breast ever becomes more benign, (6) and concludes with the advice that all benign tumors should be removed. It is a question whether it would not be safer, for the great majority of patients, if every breast containing even a benign tumor was removed. Would it not be better to accept the dictum of a prominent author who says, "The early removal of a hundred unproved tumors is better than to deny one woman deliverance from cancer of the breast." (7) Should we adopt such a dictum we will certainly save many women. By the law of averages we know that the great majority of tumors of the breast are either malignant at the time of observation or will soon become so. Is it not a fact that the great variation of malignant forms renders it imperative that all mammary growths should be removed? (13). If we are to do the greatest good to the greatest number, operations must be done in a number of questionable cases in order to give the patient the benefit of the doubt (1). There is certainly a growing feeling among surgeons that all tumors of the breast, whatever the belief as to their character, should be removed rather than await the signs and symptoms by which a positive diagnosis of cancer can be made (12).

There is another reason for removing the whole breast in cases of tumor, especially those where there can be the least doubt as to the existence of malignancy. A comparatively recent report (The Johns Hopkins Hospital) seems to show that where the indurated mass of chronic cystic mastitis is removed and a microscopic examination reveals carcinoma, even though a radical operation is done within a few days the patient may not be expected to live more than 3 years (5). The following rules have been adopted by some hospitals and are worthy of serious consideration.

1. In patients under 30, with chronic cystic mastitis a partial excision of the breast may be done in selected cases.

2. In patients between 30 and 40 with chronic mastitis the breast, fascia, and pectral muscles should be removed.

3. In patients over 36 with chronic cystic mastitis, a radical operation should be done (5).

4. In every case of doubt in chronic cystic mastitis the patient should be given the benefit of the doubt and a radical operation should be made. The same rules should be applied to a number of other breast conditions.

The danger of cancer transformation in these cases is especially menacing, as it is also in painful subcutaneous fibromata (2 and 5). The only cases of tumor of the breast where the growth alone can be removed with reasonable safety are small, recently developed nodules in women under 30 years of age. Where a tumor is of moderate size or has shown any recent tendency to increase in size the whole breast should be removed (10).

Where any considerable portion of the gland is involved the whole breast, fascia, and

muscles should be removed as early as possible (10). Occasionally cases are seen which seem to exhibit primary carcinoma of the axillary glands. In such cases a careful search of the breast tissue will probably reveal the original cancer focus (11). While an excision should be done in every tumor of the breast, in most cases this will prove insufficient, and secondary operations for removal of the breast are unsatisfactory. We must always keep prominently in mind that to withhold early operation in any case which may prove to be cancer may condemn the patient to a wretched and unjustifiable death. A few months' neglect under the guise of an attempt to cure by palliative treatment, so called, and hope may be gone forever (7). If every tumor of the breast were operated upon immediately upon the discovery of the lump the great majority of cases of cancer of the breast would be prevented or cured. By promptly removing indurated areas and benign growths, and by preventing and curing mastitis, we will do much toward preventing carcinoma (7). There should be no long period of observation in any doubtful growth in the breast. Neither should there be any half-hearted surgery for cancer of the breast. Unfortunately, the teachers of surgery, as well as the surgeons in active practice, need to be more thoroughly impressed with the fact that the only hope of cure rests on early and complete extirpation and not on prolonged effort at a differential diagnosis. To our disgrace, the majority of patients with cancer come to operation too late to be cured. Using the words of a prominent author, "Most cases of cancer which come to the surgeon are, alas, too easily diagnosed." (7).

I have often wondered just what we understand, each one for himself, by the cancer question. The backbone of any movement for the prevention, as well as the cure, of cancer, must be the medical profession, and until we are more alive to a more hopeful and rational view of the handling of cancer, little progress can be made. Following Virchow's announcement of his cellular pathology, the whole energy of the profession was devoted to the determination, by the use of a microscope, whether or not a given tumor mass contained cancer cells. We were taught to consider it a disgrace for a surgeon to remove a growth as cancerous and have the pathological report show that it contained no cancer cells.

This theory contains two important fallacies; first, that it is possible to make a clinical diagnosis of cancer in a given case; and, second, that it is not possible for the pathologist to detect all cancer cells in a given tumor by ordinary methods.

I judge that the great majority of physicians still hold these fallacious views, the repeated failure of which has brought about much of the present hopelessness regarding the treatment of cancer. Such a view also has an important relation to our methods of diagnosis.

Suppose that the question was asked of a hundred physicians at random, what are the signs and symptoms of early cancer of the breast. What do you suppose would be the answer? What element would they depend upon for an early diagnosis? Remember that the emphasis is placed on the word *early*.

From my experience with State Board Examinations mentioned above, I am led to fear that fully 90 per cent of our physicians would answer the question in a very unsatisfactory way. In other words, their early diagnosis would contain such elements as pain, enlarged glands, retraction of the nipple and dimpling in breast cases and even emaciation and cachexia. As a matter of fact, all these signs and symptoms are late, very late. When a patient consults a doctor and presents a tumor mass, with enlarged glands, pain, emaciation, etc., we have already an advanced case of cancer. Just here is where we are failing as a profession to give the people the benefit of the latest and best teaching regarding cancer. In fact, if we are to give the greatest aid to cancer cases, we must bend our best energies to prevention and not to an effort to eradicate the already fully developed disease.

As a profession we are wasting time for the patient in trying to make a positive pathological diagnosis before we initiate appropriate radical treatment. We are neither teaching nor practicing the treatment of

potential cancer. I take it that the trouble with the cancer question is with the medical profession itself, rather than the people. There is every indication that the people are anxious to learn about cancer. About every case I see has previously been examined by one or more physicians, who have used more effort to allay the fear that the lump she or he has may be cancer, than to institute vigorous radical treatment at a time when such treatment will be most effective.

DATA FROM PERSONAL CASES

The cases comprised in this study were referred by 40 different physicians; only a small proportion of them came to me primarily.

The following data give the fundamental facts regarding the 107 cases studied.

Sex:

	Cases
Males	2
Females	105
	107

Civil condition:

	Cases
Children	2
Married	66
Widows	14
Single	25

Married, 85 per cent; single, 15 per cent.

Age:

Under 1 year	1	10 per cent
15 to 20 years	2	
20 to 30 years	8	
30 to 40 years	30	60 per cent
40 to 50 years	34	
50 to 60 years	12	27 per cent
60 to 70 years	11	
70 and over	7	
Unrecorded	2	

Occupation:

	Cases
Infant	1
Student	2
Housekeeper	1
Bookkeeper	2
Nurse	4
Seamstress	8
Teachers	8
Housewives	76
Farmer	1
Cigarmaker	1
Not stated	3

Time elapsing from first appearance of a lump in breast to first observation by surgeon:

	Cases
Less than 6 months	23
6 to 12 months	5
12 to 24 months	18
24 to 36 months	11
36 to 48 months	2
48 to 60 months	2
60 to 72 months	2
72 to 84 months	1
Not stated	43

The tumor has been observed by the patient for more than a year in 58 per cent of cases. Not infrequently they had been under some form of treatment much of the time.

The main interest in this analysis centers around that group of cases which was *clinically cancer* (Group 1) at the time they consulted the surgeon. The following facts apply to these cases:

	Cases
Total number of cases	64
Number of cases operated upon	60
Total number of operations	87
Recurrences following operations	42
Cases having no recurrences	18
Well at end of 1 year	2
Well at end of 2 years	8
Well at end of 3 years	4
Well at end of 4 years	2
Well at end of 5 years	18
Total number of patients well November 1, 1921	34

	Cases
Well at the end of 5 years.....per cent	30
Well from 3 to 5 years.....per cent	40
Well from 1 to 5 years.....per cent	56
No report received from	12
Inoperable	4
Microscopical report of cancer	33
Microscopical report of no cancer	16
No microscopical examination	27
Operative mortality	0

Five patients who had recurrences and were re-operated upon lived 5 years or longer.

Only 12 per cent of the cases which had fully developed clinical signs were well after 5 years.

Number of cases of *potentially cancer*	26
All advised to have nodule removed for microscopical examination.	
One case which was congenital has since been operated upon, and microscopical examination showed growth to be benign.	
Lost sight of, having been seen only a few times	5
Still have nodule but no other development, although there is still ample opportunity	5
Either the tumor or the whole breast removed	15

Cases originally classified as "potentially cancer" were transferred to the "clinically cancer" group, upon finding enlarged glands in the axilla which could not be palpated 8

Doubtful diagnosis 13

These could not be followed; several were observed only a few times. All were advised to report at least every 3 months for examination. No operation advised.

The following facts were recorded:

Primary soft or undefined nodule in the breast 7

Recurrent nodule in breast, axillary glands, or scar from previous incomplete operation 12

Primary hard nodule in breast 89

Whole breast a mass 13

Retracted nipple 14

(This does not include the cases where the whole breast was a mass, because in practically all these cases the nipple was retracted.)

Dimpling 6

History of injury 3

(A number attributed pressure of clothing as a cause, but this was more or less uncertain.)

History of infection 7

Axillary glands on the same side involved. 54

Cervical glands enlarged 11

Mediastinal glands involved 2

Pain a factor in 44

Recurrence in the scar 18

Recurrence in the cervical or mediastinal glands 7

In several cases recurrence in sites named.

Postoperative swelling of arm 6

Recurrences were as follows:

After primary nodule was excised including the cases in which the nodule was excised for diagnostic purposes and complete operation was done later 16

After the breast was excised 3

After the breast, muscles, and glands were excised, that is, complete operation 7

Several cases had more than one recurrence as follows:

2 recurrences 9

4 recurrences 1

Primary nodule excised and followed by complete operation and no recurrence in 8

Primary excision of breast only in 6

Recurrences in 3

Total number of operations in all groups.. 102

Four operations 3

Three operations 4

Two operations 15

Refused operation 15

Observation advised in 10

(No operation required.)

Cases classed as "potentially cancer" reported by laboratory as positive as to cancer 7

(This transferred another group which I had originally classified as "potentially cancer." This group originally contained 41 cases but developments at operation reduced number to 26.)

I cannot say that I am extremely proud of my results in cancer of the breast but I place them before you, such as they are, with the hope that by a frank presentation and discussion we may develop new energy and take new hope in dealing with these cases.

REFERENCES

1. Mayo, W. J. Surg., Gynec. & Obst., 1920, xxx, 23.
2. Doyen, E. Surgical Therapeutics and Operative Technique. vol. ii, p. 347.
3. Adami, J. George. The Principles of Pathology. vol. ii, 940.
4. Warbasse, James Peter. Surgical Treatment. vol. ii, 474.
5. Ibid. p. 475.
6. Ibid. p. 476.
7. Ibid. p. 477.
8. Rodman, William L. Diseases of the Breast. p. 254.
9. Cheatle, Sir G. Leuthal. Brit. J. Surg., 1921, January, p. 285.
10. Finney, John M. T. Keen's Surgery. vol. iii, p. 579.
11. Handley, W. Sampson. Oxford Surgery. vol. iv, p. 579.
12. Gask, George E. Index of Differential Diagnosis, p. 745.
13. Quervain, F. de. Clinical Surgical Diagnosis. p. 224.
14. Eisendrath, Daniel N. Surgical Diagnosis. p. 227.

STRICTURE OF THE BULBOUS REGION

By Dr. GERMAN DIAZ LOMBARDO, Mexico City, Mexico

STRICTURES of the bulbous region which in many cases are the result of blenorrhagia, are frequently found. Such strictures, as well as all those of the urethra, for their study may be divided clinically into recent and chronic. We shall not consider recent strictures in the present study as they are not far enough advanced, and as a rule they are treated as are any urethral strictures.

In studying chronic strictures, we must bear in mind the anatomopathological lesions of the affected area and the deformities and lesions behind the stricture.

Referring to the lesions in the region of the stricture, nothing can be said of special interest except that the urethra tends easily to contract after dilatations. As to the lesions behind the stricture I would call attention to the dilatation of the entire posterior urethra, a somewhat important factor. This dilatation is so great and the membranous urethra and the prostatic urethra expand to such an extent that it might be said they form in some cases a prevesical cavity. Probably, on account of this exaggerated dilatation, the neck of the bladder is found rather high. Even though this position may be the result of the dilatation I wish to state that in such cases I have found the neck of the bladder of a fibrous consistency, which makes it very resistent to dilatation.

Because of the facility with which stricture of the urethra occurs at this point, because of the extensive dilatation of the posterior urethra, and because of the fibrous consistency of the neck of the bladder, I am convinced that treatment by progressive dilatation does not overcome the difficulty, but, on the other hand, I feel that it may help to increase the trouble; for instance, it may aggravate an inflammatory condition of the verumontanum. As I have said I will consider here only chronic strictures, that is, those in which there are present dilatation of the posterior urethra and the cavity I have referred to. This cavity in some cases I have operated on has been very large. Therefore, it seems to me, that the therapeutic problem in such cases is to restore the urethra to its normal caliber and to eliminate the cavity. Dilatation of the stricture by catheter, as I have said, does not give permanent results. However, even if it were possible by such a manœuvre to restore the urethra to its normal caliber, there is still the problem of correcting the dilatation of the posterior urethra, and this cannot be overcome with catheter nor by means of extensive dilatation of the neck of the bladder which would be necessary in order to overcome its fibrous state.

Dilatation of the posterior urethra, which is generally infected, probably results in retention of small quantities of urine, and that, in turn, leads to chronic inflammation of the region and of the verumontanum. This last condition is associated with some important symptoms, among which may be mentioned impotence, urethral neuralgias, and neurasthenia. Patients thus afflicted and incorrectly treated by means of dilatation and catherization get well under the treatment but, when catheterization is suspended, the condition promptly recurs, and with each recurrence the urethral symptoms and the local and general manifestations are more marked and rebellious to treatment. For this reason I have for some time past adopted the practice of operating upon these cases.

The technique consists in making a large, internal urethrotomy (Otis), so as to insert at the point of stricture a No. 60 Beniqué. An external urethrotomy is made to reach the neck of the bladder, which is dilated from 1.5 to 2 centimeters. If necessary little cuts are made in it. Treatment of the cavity, which is the result of dilatation of the posterior urethra, consists either in breaking up the adhesions of the posterior wall of the urethra to the posterior urethral wall when the cavity is not large, or if the cavity is large in resection of a portion of urethra from the prostatic

and membranous region. As, for 3 or 4 days, the posterior urethra is canalized by the perineal section, this drainage assists the desinfection of the cavity, and, therefore, the treatment is complete.

I have operated upon ten cases this year and in these patients I have been able to study this important region, the posterior urethra. In some of them I have found a real diverticulum, and I have afterward been able to demonstrate that after operation the urethra still has a large caliber and that the cavity has decreased in size or has disappeared. The ease with which vesical catheterization is accomplished and urethroscopic examination is made establish the fact that the cavity has been modified. All the patients are very well pleased with the results of their operation.

CONCLUSIONS

As I have said, I believe that recurrences are the cause of urethral papillomata, impotence, urethral neuralgias, and neurasthenia, and that treatment by progressive dilatation is only palliative and less permanent after each relapse. For these reasons I purpose to go on studying the treatment described, and I shall continue to follow up my cases so as to confirm more strongly my conclusions which at the present time may be stated as follows:

Treatment of strictures of the bulbous region is imperative to prevent chronic inflammatory lesions of the verumontanum or to cure them when they exist.

Progressive dilatation results in neither prompt nor permanent cure.

OBSERVATIONS ON TWO THOUSAND FOUR HUNDRED AND SIXTY-EIGHT HERNIA OPERATIONS BY ONE OPERATOR

By JOSEPH P. HOGUET, M.D., F.A.C.S., New York

THIS paper is an account of my experiences in operating on one of the common surgical conditions, namely that of hernia, from 1910 to the present time. In this period I have performed 2,468 operations for hernia of various kinds. It has seemed to me that a description of such a series of cases by one operator with a report of the results obtained might be of interest. In the *Annals of Surgery* for September, 1918, Dr. W. B. Coley and the writer gave the results in 8,864 cases of hernia, but this report included operations done by at least a dozen men and the earliest cases dated back to about 1890 when the operative technique was far from perfect. In the last 10 years, the technique used in operating upon the commoner types of hernia, with the possible exception of direct inguinal variety, has been well systematized and of a number of different kinds of operations, only a few have withstood the test of time and have been almost universally adopted as the best. Profiting by the experience of the operators of former years, I have employed the operations which most surgeons have deemed to be the most successful, and I present here the results of my experience with these operations.

In tracing results, the usual difficulties have been met. The population moves frequently in large cities but by means of the modern follow-up systems and by reply postal cards, sent out every year, the results have been obtained in a large percentage of cases.

As the type of hernia and the results of operations differ very much in children and adults, it was decided to divide each type according to age, and the age of 15 was arbitrarily chosen as that which differentiated a child from an adult. It was thought best to describe each kind of hernia separately.

INGUINAL HERNIA IN CHILDREN

The majority of the children in this series were operated on between the ages of 4 and 12. Many were operated on in the first year of life, but these were the exceptional cases where the hernia was so large that there was a real danger of strangulation and where on account of its size, it had a definite effect on the child's general health. It is usually my practice to advise the use of a truss, when the hernia is small, up to the age of 3, but when either of the two conditions mentioned above are present, there should be no hesitancy whatsoever in advising operation. The danger of respiratory complications is probably very much exaggerated and can be materially lessened by the administration of ether by the drop method by an expert, and it should be remembered that in these cases, only enough anæsthetic is necessary to keep the child from moving. A deep anæsthesia should never be employed. The only other danger is that of postoperative contamination of the wound with urine. This can easily be avoided by the use of the dressing advocated by the writer a number of years ago and used successfully in a number of cases. In these young patients, when the skin is sutured, the first dressing is made of separate layers of gauze, saturated with collodion so that the edges of the dressing are hermetically sealed to the skin. Over this a compress soaked in liquefied vaseline or boric acid ointment is applied and is changed as often as it is found to be wet with urine. The collodion dressing need only be changed about the eighth day.

In this series there were 745 operations for indirect inguinal hernia and 3 for direct inguinal hernia in boys under the age of 15. The Bassini operation, with transplantation of the cord, was done in most of these cases. The same operation was done in the three direct hernias as these patients were found to have such good musculature that a rectus transplantation was not deemed to be necessary.

There were 79 cases of indirect inguinal hernia in girls under 15 and not a single direct hernia. In these cases, the Bassini operation

was also employed, the round ligament being dissected from the sac and not transplanted.

This makes a total of 827 operations for inguinal hernia in children of both sexes under 15 and in this series not a single recurrence has been found to date. This, of course, is a great argument for operation in early childhood. There was not a death among these 827 cases. Postoperative complications have been exceedingly rare and have been limited to a few cases of bronchitis and a few of mild acidosis. Nothing approaching a real pneumonia has been seen.

INGUINAL HERNIA IN ADULTS

There have been 963 operations for indirect inguinal hernia in males over 15. In the great majority of these cases, the Bassini operation, with transplantation of the cord, has been done. This, to the writer's mind, is the ideal operation for this type of hernia, especially with the use of one suture above the cord at the internal ring and with the inclusion of the reflected aponeurosis of the external oblique in the lowermost suture at the inner part of the canal next to the pubic spine. In a few cases the Wyllys Andrews and the Halstead operations have been done. In a small number of patients where the cord was very thick, the Bassini, without transplantation of the cord, was done. In 8 cases where the conjoined tendon was unusually weak, the rectus muscle was transplanted in addition and in another 8 cases, for the same reason, the reduplicated aponeurosis operation was employed.

In this series of 963 operations, 16 recurrences have been found up to the present time, or a percentage of 1.6. Two of these recurrences were in operations for recurrent hernia. There were 4 deaths. One was from acute yellow atrophy of the liver in a man of 45, where chloroform had been used; and 1 in a man of 81 from cerebral embolism. This case was done under novocaine for a partially incarcerated and very painful hernia. Two of the deaths were in strangulated cases where a general peritonitis was already present at the time of operation.

There have been 108 operations for indirect inguinal hernia in women. Contrary to the writings in most textbooks, this condition is much more common in women than the femoral variety. In all of the cases of this series, the Bassini operation was found to be most satisfactory, the round ligament being easily stripped off from the sac, dropped back, and not transplanted. That this condition in women is easily cured is proven by the fact that, in this series, there has not been a single recurrence up to date. There was one death, however, in a woman of 45 who suddenly developed an acute nephritis on the fifth day after operation.

There have been 76 operations for undescended testis in boys under the age of 15 and 42 in men above that age, making a total of 118. The majority of those under 15 were operated on from about the eighth to the twelfth years and those over 15, at about the age of 25. In all of these cases, the Bevan type of operation was done, with or without the division of the spermatic vessels, depending on the length of the cord. Complete division of all of the vessels of the cord was done in a number of cases and in none was it found to have any bad effect on the growth of the testicle, either immediately after the operation or in later years. Where the testicle is exceptionally high and where, even after division of the cremasteric fascial bands and the spermatic vessels, it cannot be brought down low enough, it has been found that the vas can be lengthened to the extent of about 1 inch by dissecting its terminal portion or the convoluted part of the epididymis away from the tunica vaginalis. In all but 3 cases of undescended testis, a patent funicular process has been found so that it must be remembered that this condition is practically always associated with a congenital inguinal hernia. In this series of cases there has been no recurrence of the hernia but the results as to the position and after development of the testicle have been very variable. It has constantly been found that when this condition, either in boys or in men, is accompanied by an underdevelopment of the scrotum, operation is always disappointing in its results even though the cord has been found to be long. In these patients, the hernia can easily be cured, but on account of the absence of the scrotum, the

testicle will generally not remain lower than the pubic spine. In a small number of cases, generally from the ages of 10 to 20, the undescended testicle has been found to be atrophic before operation and, in these, operative interference gives variable results. In some it is immediately followed by an increase in growth, and in others the atrophy has been continuous, so that in two cases the testicle was not palpable after about 1 year following the operation. It is my opinion that operation should be advised in all cases of undescended testicle after the eighth year and that the operation of choice is the Bevan operation with the continuation of the dissection of the proximal epididymis. There have been no deaths in this series.

The subject of direct inguinal hernia is most interesting. It has been my experience that the more of these cases that are seen the greater are found to be the variations of the anatomy of the inguinal region. In many cases the conjoined tendon is well developed and the rectus muscle thin and narrow and in many others the former is represented by only a few sparse fibers and the latter is broad and thick. In all cases of direct hernia an indirect sac can be found. In the majority of the cases it is only a small peritoneal protrusion not more than an inch long, external to the deep epigastric vessels, and in some is seen the typical saddle-bag hernia where the indirect sac is as long as the direct. It is the conviction of the writer that the proceedings, as advocated by him in an article on direct hernia which appeared in the *Annals of Surgery* for December, 1920, are the correct ones. As stated above, we must realize that the anatomy of the inguinal region varies greatly, but the treatment of the sac is the same in all cases. After the incision of the skin and aponeurosis the protrusion of peritoneum external to the deep epigastric vessels should first be found, pulled up, dissected free, and opened. This protrusion always exists, and in some cases can only be demonstrated by a strong pull on the cord and retraction upward of the conjoined tendon. It is not necessary to divide the deep epigastric vessels except in very rare instances. In practically every case the peritoneum of the direct sac can be pulled out external to the deep epigastric vessels by traction on the indirect sac. In this way the two sacs are converted into one, and there is absolutely no danger of entering the bladder. If this method is not employed but the opening made directly into the direct sac, the bladder is certain to be entered in some cases.

STATISTICS OF 2,468 HERNIA OPERATIONS

		Number of cases	Recurrences	Per cent	Deaths
Indirect inguinal, male	Child	745	0		0
	Adult	963	16	1.6	4*
Indirect inguinal, female	Child	79	0		0
	Adult	108	0		1
Direct inguinal, male	Child	3	0		0
	Adult	249	17	6.8	2
Direct inguinal, female	Child	0	0		0
	Adult	7	0		0
Undescended testis	Child	76	0		0
	Adult	42	0		0
Femoral, male	Child	0	0		0
	Adult	22	0		0
Femoral, female	Child	4	0		0
	Adult	59	1	1.6	3†
Umbilical, male	Child	8	0		0
	Adult	12	0		0
Umbilical, female	Child	10	0		0
	Adult	37	3	8.1	2
Ventral, male	Child	1	0		0
	Adult	7	0		0
Ventral, female	Child	0	0		0
	Adult	26	1	3.8	1
Epigastric, male	Child	2	0		0
	Adult	6	0		0
Epigastric, female	Child	1	0		0
	Adult	1	0		0
		2468	38	1.5	13, or 52 per cent

*Two of these were strangulated.
†Two of these were strangulated.

The kind of operation that should be done for the repair of the direct hernia should be decided by the anatomy of the inguinal region in each individual case. Broadly speaking the following rules can be laid down: When the conjoined tendon is strong and the direct hernia not too large, a simple Bassini operation, with transplantation of the cord, should be done. When the conjoined tendon is thin and narrow and when the rectus muscle is strong and thick, a Bassini, with transplantation of the rectus muscle, is advised. When both the conjoined tendon and the rectus muscle are weak, a Bassini, with suture of the reduplicated aponeurosis of the external oblique, offers the best chance for a permanent cure.

To date, the writer has operated on 259 cases of direct inguinal hernia. Of these, 229 were true direct hernias in adult males, 3 were direct hernias in boys under 15, 20 were

of the so-called saddle-bag type of indirect and direct hernia in adult males, and 7 were of the direct type in adult women. No case of direct hernia in a girl under 15 was seen.

Seventeen recurrences have been found in this total of 259 cases of direct inguinal hernia up to the present time. The simple Bassini was done in 104 cases with eight recurrences, or a percentage of 7.6. The Bassini, with rectus transplantation, was done in 93 cases with five recurrences, or a percentage of 5.3, and the Bassini, with suture of the reduplicated aponeurosis, in 62 cases with four recurrences, or a percentage of 6.4. This does not correspond very well with the results described by the writer in a smaller series of 142 cases as published in an article in the *Annals of Surgery* for December, 1920, where the following figures were given: Simple Bassini with 7.3 per cent recurrence; Bassini, with rectus transplantation, with 2.8 per cent recurrence; and Bassini, with suture of the reduplicated aponeurosis, with 2.5 per cent recurrence.

There were two deaths after operation for direct hernia, both from embolism, one in a man of 53 and one in a man of 67. It must be remembered that this is a condition that occurs, for the most part, in men after 40, and in these complicated cases, the operation is more prolonged, and on account of the age of the majority of the patients there is a certain element of danger.

Contrary to the impression one receives from textbooks, femoral hernia is of comparatively rare occurrence. Only 85 operations, or 3.4 per cent of the whole series, were done for this condition. No cases were found in boys under 15, and only 22 were done in males over that age. Four operations were done in girls under 15, and 59 in women over that age. From these figures it can be seen that femoral hernia is comparatively common in men.

Practically all of these cases were operated on by the so-called purse-string method after removal of the sac, and a recurrence was found only once. This was in a thin, anæmic woman with a hernia larger than a big goose egg. In this series three deaths occurred, two of which, however, were in cases of strangulation, one complicated by resection of 8 inches of intestine. One young woman, a recent case in October, 1922, died of embolism, 5 days after an operation which was absolutely devoid of complications and which took less than 10 minutes to perform.

UMBILICAL HERNIA

Umbilical hernia is generally seen either in the very young or in persons past middle age. It is very common in young infants and in them it can practically always be cured provided treatment is instituted early enough with a pad and plaster and consistently carried out. Eighteen cases of both sexes under 15 years of age have been operated on by the writer. Either the horizontal or the vertical overlapping of the fascia gives excellent results in this condition and no recurrence has been found in any patient operated on in this way. Forty-nine cases of umbilical hernia in adult men and women have come to operation. It has constantly been noticed that men with this condition come to operation at an earlier age than do the women and that in the former the hernia is usually much smaller. In most of these cases the Mayo operation is to be preferred, although in a few, even though the skin be incised horizontally, it may be found advisable to overlap the fascia vertically. In this series there has been no recurrence after operation in the men, but there have been 3 out of the 37 among the women, or 8.1 per cent. Two deaths occurred among the women operated on for umbilical hernia. One, 38 years of age, died 7 days after operation from a pulmonary embolus and another of 68 was found to have torn out all of her sutures on the third day after operation, having suffered from excessive vomiting, and though the wound was immediately resutured, she did not survive.

VENTRAL, POSTOPERATIVE, AND INCISIONAL HERNIA

Ventral, postoperative, or incisional hernia is not very common. For the most part, it follows drained McBurney incisions or the drained median suprapubic incisions in women. Postoperative hernia in laparotomy wounds above the umbilicus is exceedingly rare. There are 34 operations for ventral

hernia in this series, 1 in a boy, 7 in men, and 26 in women. In all of these, the vertical overlapping of the fascia was done. A patient of this series with a hernia as large as a grape fruit was the only one that recurred. One death occurred in a woman of 60 from a pulmonary embolus.

Ten cases of epigastric hernia have been operated on. These are hernias of the linea alba or the linea semilunaris and are rarely larger than a walnut. Two occurred in boys, 6 in men and 1 in a woman. A characteristic of this form of hernia is that it is often accompanied by digestive symptoms. All of these openings were closed with one or two purse-string sutures after removal of the peritoneal sac, and none has been found to have recurred up to the present time.

It is interesting to note that only 23 cases of strangulation were seen amongst the 2,468 operations, and the majority of these were in very young children or in men and women past middle age. Only one strangulated inguinal hernia in a young girl was seen and in this case the tube and ovary were found gangrenous within the sac. There were 6 cases of strangulated hernia in young boys, the youngest being 9 weeks old and the oldest 6½ years. In none of these was the intestine gangrenous. Six strangulated inguinal hernias occurred in men ranging in age from 42 to 68. Two of these patients had a gangrenous loop of intestine and a general peritonitis at the time of operation and survived only a few hours. The only case of strangulated femoral hernia in the male was that of a man of 42 in whom the appendix was found caught within the femoral sac. Six women were operated on for strangulated femoral hernia, and it is interesting to note that one occurred in a woman of 81, one in a woman of 78, and one in a woman of 75. All of these patients survived, but one, aged 55, in whom the intestine was resected died, as did one, aged 49, in whom no resection was done. Three patients with strangulated umbilical hernias have come to operation. All were in women and all recovered.

It is the custom of the writer to operate on all strangulated hernias under a local anæsthetic with the exception of the very young children, to whom it is necessary to give only enough ether to induce a very light primary anæsthesia. In non-strangulated cases, local anæsthesia is used only in patients where, on account of age, cardiac, or renal disease, the use of a general anæsthetic is contra-indicated. The writer feels very strongly that in ordinary cases, the efficiency of the repair of the hernia depends on the dissection of the field and it is not possible to get as good an exposure when a local anæsthetic is used. Within the last 2 years, nitrous oxide and oxygen with a preliminary dose of morphine and magnesium sulphate has been used in several hundred cases with very satisfactory results. Patients anæsthetized thus will be conscious in a few minutes after termination of operation and will suffer from no nausea or vomiting.

ETHER LAVAGE; ITS LOGICAL USE, LOCALLY, AS AN ANTI-AGGRESSIN[1]

By GEORGE DE TARNOWSKY, M.D., F.A.C.S., Chicago

EMPIRICALLY, ether has been officially on record as a local application to wounds since 1891, when Souligoux, of Paris, began its use. Curiously enough, although he treated several hundred cases of wounds and infections such as abscesses, lymphangitides, and erysipelas, with uniform satisfaction, he never sought any explanation of the beneficent reaction which he had obtained. It was also in 1891 that the same surgeon experimentally used ether in the peritoneal cavities of guinea-pigs, without any ill effects. These observations were, unfortunately for the sake of official priority, never published (1).

To the late Morestin (2), whose monumental work on plastic repair of war mutilations at the military hospital of Val-de-Grace, Paris, came to an untimely end in 1919, must be accorded official priority in the use of ether in peritoneal infections. On February 12, 1913, he reported his results at a meeting of the Société de Chirurgie, stating that he had: "Used ether since 1901 in peritoneal infections, either as a preventive disinfectant after suppurating salpingitis, in intestinal operations in which the bowel contents might have leaked, or as a curative method in grave cases of peritonitis due to perforating ulcers of the stomach or duodenum, or to acute appendicitis."

It was only natural that the advent of a new peritoneal antiseptic should have aroused suspicion, for in 1912, surgeons were pretty unanimous in their disapproval of any bactericide used in the peritoneal cavity. The clinical results, however, observed in Paris, in 1913, and later in my own service at the Cook County Hospital, were so gratifying that an attempt was made to abandon empiricism and seek a rational explanation for the beneficial effect of ether, used locally (3).

The chief questions to be answered were:

1. Did ether act as a liquid or as a vapor?

2. Was ether primarily a bactericide or a stimulant?

3. How long did the stimulant-irritant action last?

1. The answer to the first question was extremely easy. Ether volatilizes at 88° and boils at 95°F. In contact with living tissues, it becomes a vapor in approximately 20 seconds. Its cooling action as a liquid lasts only a third of a minute—to be immediately followed by the stimulant reaction of the vapor.

2. The bactericidal power of ether, though low, is nevertheless positive. In a series of 50 personal cases of suppurative peritoneal infections treated in 1914–1915, 5 cubic centimeters of pus were placed in a sterile test tube, 1 cubic centimeter of ether poured in and the mixture well shaken up before sending the tube to the laboratory for culturing. In the entire series, there was not a single growth reported. Controls were always added, in order to make certain that we were not dealing with sterile pus. Sklass (9) found that ether vapor would destroy spores because of their dehydration and would also arrest destructive ferments of organic origin. Phillips (29) carried out an extensive series of experiments with ether vapor, in order to ascertain its bactericidal power. Various strains of streptococci, staphylococci, and colon bacilli were used *in vitro*. In all strains, the resistance to carbolic acid was predetermined in order to obtain a comparison between the anti-bacterial power of ether and a known disinfectant. In general, the bacterial power of ether vapor corresponded to that of a 2 per cent carbolic acid solution. Similar experiments have been carried out by Sigwart, Fantozzi, Stadler, Jung, Pope and Warnecros. Phillips sums up his observations by stating that: "The conclusion that may be permitted from these experiments is that—even allowing for the entirely different behavior of individual bacterial strains against ether vapor—it can

[1] Read before the Chicago Gynecological Society, January 19, 1923. (For discussion see p. 98).

be admitted that germs located upon the surface of the uterus, even stubborn streptococci, can be killed with sufficient concentration and sufficiently long exposure to ether vapor. Both factors may be increased as desired, such procedure being, according to Warnecros, without danger. The fact that under high temperature and strong pressure ether vapor can reach the deeper lying germs, is especially favorable. By the introduction of ether vapor into the uterine cavity which is infected, we have, therefore, a mode of treatment calculated to supply a powerful acute therapy in septic abortion."

If ether possesses this definite bactericidal power, why should it not also permanently damage living tissue cells and create permanent adhesions? Its great volatility, rapidity of diffusion, and evanescent action, and the fact that it is the only solution used in the treatment of wounds and infections which vaporizes instantly without leaving any residue, explain this apparent paradox and, in our opinion, places ether in a class by itself.

Is ether a stimulant? Clinically, when ether is poured on living tissues, there is a primary contraction of arterioles and a sensation of cold followed, as soon as the boiling point is reached, by a violent though transitory hyperæmia accompanied, if the patient is not anæsthetized, by a sensation of warmth. Peritoneal irrigations have long since been abandoned by the majority of surgeons because of the physical impossibility of any fluid reaching the many pockets and fossæ of this cavity. As a gas, however, ether vapor is under tension and must follow the universal law of diffusibility of gases; consequently it must and does in fact penetrate every pocket, fold, and corner of the peritoneal sac, giving rise to a general, not local hyperæmia. If we recall the fact that serous surfaces are at all points capable of active phagocytosis, on account of the abundant diapedesis of white blood corpuscles which accompanies hyperæmia, we will grasp the essential *raison-d'être* of ether lavage. Because of this lymph-channel blocking hyperæmia, absorption by the serosæ is comparatively slow and there is no danger of deepening narcosis. Ten years ago it was customary to stop the anæsthetic after the local use of ether; this is unnecessary and has been discarded. Likewise, as soon as it was realized that we were dealing with the effects of ether vapor and not ether liquid, the lavage of Morestin and Souligoux—which went so far as to consume one liter of ether in a peritoneal cavity—was abandoned, and one ounce or less, depending on the cavity and its distensibility, was found to be sufficient. As pointed out by Santy (8), serous absorption of ether is a physical phenomenon due to hypertension of vapor which thus reaches the capillaries and general circulation. The same author also states that the toxic action on the endothelium is not intense because contact lasts only 10 minutes.

In order to determine the stimulant or anti-aggressin power of ether, leucocyte counts were made on thirty clinical cases of local or general peritonitis, immediately following the operation and 12 and 24 hours later. Using the pre-operative blood-count as a control, it was found that a hyper-leucocytosis of from 2000 to 5000 per cubic millimeter resulted from the local use of ether. Lienhardt (4) in 1921 obtained the same results. Reviewing the question of peritonitis, he found that collective statistics placed its mortality at somewhat over 40 per cent. In 101 personal cases of peritonitis treated by ether lavage, Lienhardt found that he had reduced his mortality to 27.7 per cent. Ether lavage, he states, has a very favorable influence on the healing process of peritonitis. It produces a local reactive inflammation, exudation, and increased production of antibodies, and thus tends to destroy bacteria. The general action of ether consists in a striking postoperative analgesia and an increased leucocytosis.

Gardner (5), experimenting in the research laboratory of St. Thomas's Hospital, London, reported that "favorable results in peritonitis could be obtained by stimulating phagocytosis and thus acting anti-aggressively. (The term aggressin is given to any substance found in the process of bacterial growth which aids the organisms in their attack upon living tissues. This substance, or toxin, acts by inhibiting phagocytosis.) Gardner proved experimentally that ether was markedly anti-

aggressive, i.e., by increasing phagocytosis it diminished the aggressive action of the toxin upon living tissue and prevented further multiplication of bacteria.

Wolff (6), in the *Journal of Experimental Medicine*, reported that she had found ether to be slightly positively chemotactic in concentrations of over 0.1 per cent, when there was an increase of about 50 per cent over the control, in the number of cells adhering.

Both from an experimental and clinical standpoint, one can positively state that ether, while having a certain bactericidal power, should not be used for that purpose as its action is too transitory to be of much value, but that its local use should be solely based on its anti-aggressive properties. By creating a rapid though evanescent hyper-leucocytosis, it aids the natural body defenses.

3. We finally come to the third and last question, i.e., the duration of the stimulant or irritant action. Basing their opinions very largely on the erroneous assumption that ether retained its liquid state in the body cavities, skeptics were—and still are—of the opinion that ether is capable—*per se*—of producing a deep enough destruction of serous surfaces to lead to the formation of permanent adhesions. That such adhesions are formed after the use of antiseptics of slow absorption which leave a residue behind them, is unquestionably true, and their use in closed cavities has almost universally been abandoned by surgeons.

Resinelli (7) quotes the experiments in Italy of Muscatello, Burci, and Marchetti on guinea-pigs. These investigators concluded that, unless the peritoneal serosa is profoundly altered, it has no tendency to form adhesions, even if the adbominal cavity is opened, and that the mere destruction of peritoneal epithelium is not sufficient to produce adhesions. We know that the peritoneum also possesses a high power of digestion, so that false membranes, fibrin plaques, etc., are rendered absorbable.

We have already mentioned the fact that Souligoux had used ether experimentally in the peritoneal cavities of guinea-pigs without noting any ill effects.

In 1914–1915, J. J. Moore—at that time bacteriologist at the College of Physicians and Surgeons of Chicago—undertook, at the writer's suggestion, a series of ether experiments on guinea-pigs. In a fairly large series of cases, he was able to demonstrate a primary stage of hyperæmia, the appearance of fine flocculent adhesions lasting from three to five days, terminating in a *restitutio-ad-integrum*.

Santy (8), of Lyons, France, testing the effect of ether on the peritoneal cavities of rabbits, reported his findings as follows:

First 24 hours: Slight congestion of peritoneum.

Third day: Marked congestion of peritoneum.

Fourth day: Lessened congestion; capillary dilatation.

Twelfth day: Macroscopically normal peritoneum; microscopically the omentum is slightly thickened.

Twenty-fifth day: Normal peritoneum.

Aglae Sklass (9), also of Lyons, arrived at the same conclusions.

Adverse experimental reports are those of Terraca (10) and of Cubbins and Abt (11). The former states that the injection of ether in 1:1000 of body-weight quantity caused death of the animal in a few minutes if the pleural cavity remained closed, but that the same quantity of ether was well tolerated if the ether vapor was allowed to escape through a fistula. The injection of 1:1000 of body weight of ether into the animal's peritoneal cavity was well tolerated, but he found hæmorrhagic infarcts and firm adhesions. Cubbins and Abt, using one ounce of ether to a 15-pound dog, conclude that: "It (ether) is not nearly so violent an irritant as a 3½ per cent solution of tincture of iodine. When the peritoneum is manipulated with the gloved hands and gauze sponges, and ether applied, there is not much more trauma than one would expect with manipulation alone, but the ether did seem to have a very marked effect in reducing the resistance of the peritoneum to infection. From these experiments we cannot see the value of the use of ether in the peritoneal cavity, and it is our candid opinion that individuals in whom it is used will recover in spite of it and not because of it."

From a close study of the pictures of canine peritonea which illustrate the latter article, one is forced to the conclusion that firm adhesions were the invariable rule in that particular laboratory, whether antiseptics were used or not! One must, however, remember that, at the time these experiments were being carried out, the quantity of ether used, per body weight, was entirely too large. No effort was made to control the leucocyte curve before and after ether lavage of the peritoneum, and the simultaneous injection of pyogenic bacteria and ether in a normal peritoneum does not—by any stretch of the imagination—conform to clinical conditions in the human.

Reviewing a clinical experience extending over a period of 10 years, including extensive war work overseas in addition to charity and private work in Chicago, no case of post-operative adhesions, revealed symptomatically or necessitating a secondary laparotomy, has come to our notice, and we are firmly convinced that ether vapor, introduced in proper quantity in any of the serous body cavities, is incapable, *per se*, of producing firm and permanent adhesions.

During the World War, practically all French, some Belgian and Italian, and a few British surgeons used ether in the primary local treatment of wounds. The conclusions adopted by the Inter-Allied Surgical Conference held in 1917 repeatedly advocated the local use of ether in the treatment of wounds, especially those involving serous cavities. Since 1919, an ever increasing number of favorable reports have appeared in the surgical publications of European countries. There is even quite an extensive literature on the subject of the treatment of pertussis by means of intramuscular injections of ether.

In America, many industrial surgeons—especially ex-army surgeons—are using ether in joint and other infections. J. J. Moorhead, of New York (12), writing on the subject of purulent synovitis of the knee, states: "The injection of 2 to 4 drachms of ether after each aspiration will be of decided benefit. I have used ether injections with great satisfaction since the method was called to my notice by Major Lardennois, then consultant of the French 5th Army Corps with which I was serving." Moorhead, (13) while Commanding Officer of Evacuation Hospital No. 10, A.E.F., used ether in thoracic and gas-gangrene cases as did also the French surgeons Tuffier, Souligoux, Lardennois, the late Morestin, and many others. In a very recent careful review of the final reports of all Mobile and Evacuation Hospitals of the A.E.F. in France, one was struck with the almost uniform praise given to the use of ether lavage in wound infections. One report states: "The method which gave universal satisfaction to the patient and surgeon was the thorough cleansing by shaving and ether spray of the entire surroundings of the wound and the cleansing of the wound itself by ether spray and ether-soaked sponges. After a day or so, the wound was strapped with adhesive in such a manner as to cover it almost, if not quite entirely, and relieve all tension upon its edges. This dressing was allowed to remain 48 to 72 hours. On its removal, a large quantity of secretion was generally found which was gently wiped away and the ether toilet again performed. Absolutely no other solution was allowed to touch the wound. In this manner large denuded surfaces of months' duration, which had resisted other methods of treatment, were entirely healed over in a few days."

A still more complete army report on ether includes the following orders for the surgical units: "After débridement of the wound, the latter shall be douched with ether and drained—if necessary—with gauze moistened with ether. A wet dressing of ether should then be applied and a copious dressing of non-absorbant cotton placed over it. All joint wounds and compound fractures should be irrigated with ether and dressed with ether-soaked gauze dressings."

One could go on quoting numerous similar reports; all tend to prove that the advantages of ether lavage were recognized by a majority of the army surgeons whose opportunities permitted them to follow this procedure.

Neudorfer (14), in 1921, reported 22 cases of peritonitis treated by ether lavage, with 17 recoveries. Of the five deaths, one from pneumonia and one from a phlegmon of the floor of the mouth, have no connection with

the peritonitis. The author himself states that he admits only one failure in his series.

Letzko (15) reports that he finds ether lavage very beneficial. Even Russian surgeons have tried the method and Mandelstamm (16) reports that he has been able to verify the superior results of ether lavage. Cheinisse (17) published in the *Presse médicale* a collective review on the tretament of pertussis by means of intramuscular injections of ether. Genoese (18), d'Aroma (19), and others have written on the same subject.

TECHNIQUE OF ETHER LAVAGE

Ether is not a panacea; it will not prevent postoperative shock, hæmorrhage, or adhesions caused by bungling surgery and will not save patients who are too toxic to respond to any kind of stimulation. We firmly believe on the other hand that ether lavage is a local and general adjuvant to nature's combative and reparative forces, i.e., it is an anti-aggressin.

Whenever, from any pelvic or abdominal source of infection, free or localized pus is found, the organ or organs involved are first of all treated according to indications. Pus is wiped or preferably suctioned without breaking down protective barriers—if any exist—and the surgeon begins to close the peritoneum. While doing this, one ounce of ether is poured into the pelvic or peritoneal cavity, without attempting to wash or otherwise disturb the normal relation of any of the abdomino-pelvic organs. No swabbing out is done, but the peritoneum is closed as rapidly as possible in order to minimize the loss of ether through evaporation. The anæsthetic is not interrupted.

Drainage, exclusively of the cigarette variety, should be instituted only in cases where it has been impossible to remove all macroscopically necrotic tissue or where a fistula is either present and cannot be closed, or is probably going to occur.

While admitting the fact that present-day indications for drainage have markedly lessened through improvement in technique and an increasing confidence in the protective and reparative forces of the peritoneum and other serous sacs, we are closing, without drainage, pelvic and abdominal incisions which we certainly would drain if ether were omitted from our habitual technique.

We again desire to emphasize the fact that the proper method only requires a pouring in of ether, without washing, sponging, mopping, or otherwise traumatizing serous or synovial tissues. Ether gas, under tension, admirably accomplishes the dissemination which the original advocates of the method endeavored to obtain by systematic washing out or lavage of the peritoneal folds and fossæ.

In all cases of pelvic infection, even when free pus is not encountered, ether has been poured into Douglas's pouch in order to aid nature's reparative forces.

Postoperatively, ether is unquestionably beneficial; it tides over the immediate period of restlessness. Patients remain in a somnolent state for several hours.

While it has seemed to us that postoperative pain, nausea, and distention have been lessened since adopting ether lavage, we are not unmindful of the fact that omission of preoperative and postoperative cathartics, minimum handling of tissues, and abolition of tubal or gauze drainage have all contributed toward obtaining an easy and uneventful convalescence.

CONCLUSIONS

1. Ether lavage is not advocated on account of its bactericidal power.

2. In contact with living tissues ether volatilizes in 20 seconds, disseminates rapidly as a vapor and is slowly absorbed without leaving any residue.

3. Experimentally and clinically, ether has been proved to be an anti-aggressin, producing or increasing leucocytosis and therefore aiding nature's defenses against infection.

4. As stated in a previous article (21), when we shall all be aggreed regarding the defensive and not destructive meaning of serous or synovial inflammations (peritonitis, pleuritis, synovitis), and when our technique shall be entirely devoted toward increasing their natural defensive properties, our operative mortality and postoperative sequelæ will be reduced to their normal minimum.

5. We firmly believe that Metchnikoff prophesied truly in one of his lectures saying: "When we shall have a better understanding of the physiological action of phagocytes, our efforts will be directed toward the finding of methods which will enhance the activity of the white blood corpuscles in their fight against bacteria and toward other methods for the preservation of essential body cells from the attacks of phagocytes."

REFERENCES

1. Souligoux. Ann. d. Soc. de Chir., Paris, 1913, Feb. 19.
2. Morestin. Ibid. 1913, Feb. 12; also Feb. 19, Feb. 25, June 4, Oct. 22.
3. Tarnowsky. Sulphuric ether lavage in infections; the Souligoux-Morestin method. J. Am. M. Ass., 1914, lxii, 281.
4. Lienhardt, Bruno. Die Aetherbehandlung der Peritonitis. Schweiz. med. Wchnschr., 1921, li, 674.
5. Gardner, A. D. Aggressins in peritonitis and appendicitis. Quart. J. Med., Lond., 1914, July 7, 325.
6. Wolff, E. P. Experimental studies on inflammation; influence of chemicals upon the chemotaxis of white blood cells *in vitro*. J. Exp. Med., 1921, Oct. 1, 394.
7. Resinelli, G. Il trattamento chirurgico del peritoneo. Ginecol., Firenze, 1913, x, 60–74.
8. Santy. Le lavage à l'éther. Lyon chir., 1914, June.
9. Sklass, Aglae. Thèse de doct., Lyon, 1914.
10. Terraca, Luigi. Ricerche sperimentali sull 'azione dell 'etere introdoto nella cavita pleurica. Riforma med., 1921, Aug. 13, 778.
11. Cubbins and Abt. Preliminary report concerning the effect of foreign substances in the peritoneal cavity. Surg., Gynec. & Obst., 1916, lxxii, 571.
12. Moorhead, J. J. Surg. Clin. No. America, 1922, 1614.
13. Idem. Traumatic surgery problems. J. Am. M. Ass., 1921, lxxvi, 1642–46.
14. Neudorfer, A. Die Aetherbehandlung der Peritonitis. Zentralbl. f. Chir., 1921, xlviii, 2.
15. Letzko, W. Pathologie und Therapie der Peritonitis. Zentralbl. f. Chir., 1921, Oct., 422.
16. Mandelstamm, A. E. Zur Frage der Aethereinfuehrung in die Bauchhoehle zwecks Verhuetung von Peritonitis. J. Akush., 1922, xxxiii, 95.
17. Cheinisse. Les injections intramusculaires d'éther contre la coqueluche. Presse méd., Par., 1920, July 31.
18. Genoese, G. Iniezione dell'etere nella cauqueluche. Policlin., 1921, Feb. 7.
19. d'Aroma, A. Injections of ether intravenously for pertussis. Policlin., 1921, June 6.
20. Lardennois, G. Quoted in Med. War Manual No. 7, p. 144.
21. Tarnowsky. Postoperative sequelæ and their avoidance. Illinois M. J., 1917, May, 293–295.
22. Seliba, J. The antiseptic action of ether in peritoneal infections. J. Am. M. Ass., 1916, April 22.
23. Mercade, S. Ether in peritonitis. J. de chir., 1914, iii, No. 2, Aug.
24. Condamin, R. Les pansements à l'éther en gynécologie. Lyon méd., 1914, xlvi, No. 9.
25. Marchak. Bull. et mém. Soc. Anat., Par., 1914, lxxix, 166.
26. Dergang. Wien. med. Wchnschr., 1913, Aug. 14.
27. Phélip and Tartosis. Ann. de gynéc. et d'obst., 1913, xl, 698–747.
28. Jeanneret, L. Rev. méd. de la Suisse Rom., Genève, 1913, Dec. 20.
29. Phillips, E. Die desinfizierende Einwirkung von Aetherdaempfen auf Eitererreger. Muenchen. med. Wchnschr., 1922, lxix, 1112–1113.
30. Behle, A. E. General septic peritonitis and its treatment. Northwest Med., 1922, xxi, 361.
31. Allaben, J. E. Principles underlying the treatment of septic peritonitis. Illinois M. J., 1915, July.
32. Sigwart. Arch. f. Gynaek., 1918, cix, 1.247; Muenchen. med. Wchnschr., 1922, No. 14.
33. Fantozzi. Sull' uso dell 'etere. Policlin., 1920, No. 26.
34. Pope. Some experimental data on the Morestin treatment. Schmidt's Jahrb., No. 323.

DEPARTMENT OF TECHNIQUE

THE NEAR NORMAL RESTORATION OF A LIMB AFFLICTED WITH THE DISABLING CONSEQUENCES OF AN OLD POTT'S FRACTURE[1]

By FRANCIS REDER, M.D., F.A.C.S., St. Louis

THE difficulty encountered in an endeavor to restore to functional efficiency a crippled ankle joint, the sequence of trauma, is apparent only to one who undertakes the procedure.

It is not so very unusual to see surprisingly good function after fractures of bones essential to joint formation that have been surgically neglected. A Colles' fracture may be cited as an appropriate example. However, deformities are not without significance and they may be of such serious degree that compensatory muscular hypertrophies are inadequate for restoration of the normal physiological balance between the bones and their flexible stays.

A Pott's fracture deformity embodies many of the disappointments that have been unlooked for following the release of the limb from its splinting. The conformation of the structures about the ankle joint may appear anatomically correct; the joint may exhibit a satisfactory mobility; the functional efficiency may appear promising and during the first 6 months encouraging progress usually may be made with walking exercises. This is generally a regular course of action with most fractures of the lower extremities. The time following the first 6 months, however, may find that some fractures of the Pott's type discharged as cured are giving signs of failing efficiency. This evidences itself at first by fatigue and a dull heavy pain in the foot and lower part of the leg.

Later the prescribed exercises are not indulged in with the former resolutions but are generally continued in the hope of overcoming what appears to be only a temporary weakness of the ankle joint. Eventually, it will be noticed that the foot is assuming an everted position as more weight is brought to bear upon it, with the lameness more decided, and the pain when walking more severe.

Though it is apparent to the patient that the condition is not improving, many will continue in this plight for a long time wholly incapacitated to do any work. What is the reason that this class of fractures should give such an unpromising result? Is it the severity of the trauma or is it surgical neglect?

In the first place permit me to define a Pott's fracture. The present teaching is prone to "lump" many of the fractures about the ankle as Pott's, or a modification of Pott's. Such teaching is not conducive to the best interests of those who do not specialize in this branch of surgery, and will show itself in the end-results, the sequence of improper treatment.

A Pott's fracture is always an abduction lesion. It is a definite entity with characteristics that have linked the name of the great St. Bartholomew surgeon with this trauma ever since he gave us his description in 1779.

In simply noting that a Pott's fracture consists of a fracture of the lower end of the fibula not usually higher than 2½ inches, a fracture of either the tip or a greater portion of the internal malleolus, a tearing of the interosseous ligament by the wedge-shaped edge of the partially everted astragalus, and if the force is sufficiently strong a luxation of the lower end of the tibia, it is rather difficult for one not experienced with these fractures to realize how disastrous an end-result can be.

The poor results in the treatment of a Pott's fracture, excluding a wrong diagnosis for which, through the notable increase in our knowledge of details obtained by the use of the roentgen-ray there is no longer any excuse, are not poor because the proper splint is not applied, but they are poor because in all probability there has been a faulty reduction. If the reduction has not been faulty, it is very likely that the proper maintenance of such a reduction during the reparative process has been overlooked.

Another reason for a poor result is the too early release of the foot and leg from its splinting. In

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this respect a Pott's fracture is unlike any other fracture because the tibio-fibular and interosseous ligaments play a very important rôle in preventing the widening of the mortise within which the astragalus is held.

When the mechanism producing a Pott's fracture is considered, the importance of these ligamentous structures becomes clearly apparent.

In defining the mechanism of this type of fracture we have primarily a fracture of the fibula caused by pressure being brought to bear on the tip. The foot is turned out causing the interosseous ligament to be put on great tension. If this ligament is sufficiently strong to withstand this tension, the break in the fibula will be usually higher up than at the tip.

The next phase is a fracture of the internal malleolus to a greater or less degree. As the force continues and the weight of the leg comes on the astragalus, this tarsal bone in its partially everted position becomes wedged between the tibia and the fibula, bringing disaster to the interosseous ligament.

If the force ceases here a Pott's fracture without serious complications is produced. However, should the force continue, a compounding of the fracture and also a forward luxation of the tibia may result.

It is obvious from an analysis of this mechanism that in a Pott's fracture good restoration of these ligamentous structures is absolutely necessary before walking exercises are permitted. To have this assurance it becomes imperative that this type of fracture be kept confined for a longer period in a properly adducted position than is usually allotted to an ordinary fracture. The objective is a firm ligamentous union and this will require more time than a bony union.

The interosseous ligament harbors the essential lesion and is the most important factor so far as the final result is concerned. If repair of this structure is accurate and firm, the mortise of the ankle joint will be very near normal and the patient will be able to walk square footed, and the foot will be plumb with the leg.

If for some reason or other the interosseous ligament should remain loose or torn, a wedging of the astragalus between the tibio-fibular articulation will take place with the resultant eversion of the foot soon after weight-bearing is permitted.

The increased strain of these exercises upon the internal-lateral ligament will have a tendency greatly to impair the union which is usually fibrous between the fractured internal malleolus and the tibia. This will result in a displacement

Fig. 1 (at left). Old Pott's fracture with characteristic eversion deformity.

Fig. 2. This shoe had been worn for 3 months. The light area on the sole shows where there was no contact in walking.

of the malleolar fragment with more damage to the mortise. It is at this stage that the eversion of the foot becomes pronounced.

When such a condition has once established itself, the eversion will be permanent, continually increasing in degree. Appliances, principally braces, are of little avail and there remains no other way than to treat this condition on an operative basis.

A Pott's fracture accurately diagnosed and properly treated from its incipiency will usually result in satisfactory functional efficiency of the ankle joint. The salient features in this type of fracture are the recognition of a possible anterior luxation of the tibia, its successful reduction when present and its maintenance during the after-treatment. Replacement of the external malleolus as near anatomically correct as is possible is essential, and an accurate apposition of the displaced internal malleolus with the fracture surface of the tibia to form a mortise that will hold the foot plumb with the leg, must be assured. Finally the posterior and lateral splinting, preferably with plaster of Paris, holding the foot in

Fig. 3 (at left). Old Pott's fracture. Anteroposterior roentgenogram 10 months after injury. Note healed fracture of fibula about 2 inches above joint with lateral displacement. Note fractured internal malleolus rotated and displaced downward. There is non-union. The astragalus shows marked tilting caused by a damaged mortise. There is strong eversion of the foot. A line drawn along the middle of the tibia would strike the inner border of the astragalus, whereas normally it should fall about the middle of the bone.

Fig. 4. Lateral roentgenogram of same case as in Figure 3. Note rotation and downward displacement of internal malleolus, also lateral displacement with some shortening of fibular malleolus. The tibio-astragaloid articulation shows by the large gap the partial loss of its normal support.

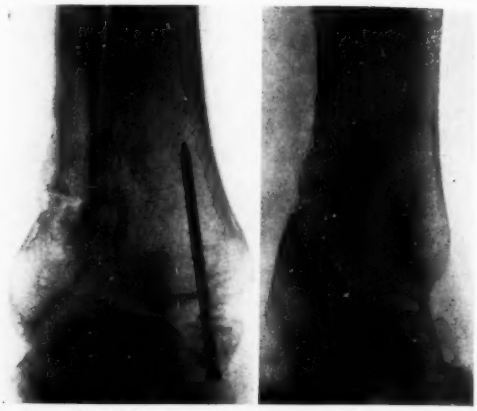

Fig. 5 (at left). Anteroposterior roentgenogram of same case 8 weeks after operation showing internal malleolus held in position by nail. The fibular malleolus shows the loss of substance sustained in correcting the lateral displacement. When the bone ends were brought to an almost normal alignment there was a gap caused by loss of bone to the extent of about half an inch. This gap was bridged with a transplant. Note the filling of the gap by new bone.

Fig. 6. Lateral roentgenogram revealing the tibio-astragaloid articulation more nearly normal than in the anteroposterior view, because the part of the picture showing where the edge of the articular surface of the astragalus had been forced like a wedge between the tibio-fibular articulation is considerably obscured.

flexion on the leg with an associated adduction carried beyond the mid-anatomic line completes the initial procedure. This position is absolutely necessary to secure a perfect contacting of the normally contiguous surfaces of the tibia and fibula, thereby aiding the torn interosseous ligament to regain as much of its normal integrity as is possible, and averting a tibio-fibular diastasis.

When a Pott's fracture with an apparently good result is released from the splints after the usual time necessary for restoration, yet gives evidence of an eversion deformity 6 months later, it is obvious that some of the structures about the ankle joint were either not properly aligned or were inefficiently repaired.

The ankle joint normally is perfect in its ginglymoidal action. Any structural deviations, the result of trauma, will seriously impair its normal movements.

The factors usually contributory to a Pott's eversion deformity are a posterior luxation of the ankle, a united but displaced fibular malleolus, and a non-union, i.e., a fibrous union, of the tibial malleolus. These structural deformities cannot be recognized with any certainty merely by an inspection or a manipulation of the joint.

A roentgenogram will reveal the factors responsible for any faulty relationship, and an exact interpretation becomes imperative when an operation for the correction of the deformity is contemplated.

The operation on an old Pott's fracture with a bad result is a difficult undertaking and should never be hastily considered. It is a painstaking piece of work requiring the closest vigilance in the observance of the aseptic rituals. Perhaps the greatest difficulty encountered is the reduction of an anterior luxation of the tibia on the astragalus. An exostosis on the articular surface of the tibia may prove obstructive to a successful reduction and its maintenance, and may require the use of the chisel. In extreme conditions it may become necessary to resect the anterior portion of the tibia to restore the bone to its normal relationship with the astragalus.

The fractured fibular malleolus may be displaced from its normal site. It must be operatively brought into correct anatomical alignment for the proper support of the astragalus.

This will necessitate refracturing of the bone and a possible rectification of the tibio-fibular articulation to facilitate malleolar restoration. To prevent recurrence of the displacement the fixation of the fibular malleolus to the tibia is secured with one or two nails.

The tibial malleolus may show a mal-union or no union at all, and may have been displaced downward and rotated outward by the pull of the soft parts. It will be necessary to dissect this bone-fragment out of the connective tissue mass and free it with the attached deltoid ligament from adventitious position that contact with the adjacent surface of the tibia may be made possible. Freshening of the broken surfaces will be necessary and their accurate apposition must be secured with a nail driven through the fragment and into the shaft of the tibia. These corrective measures are carried out through two lateral incisions anterior to the malleoli and sufficiently large to facilitate the work.

The operation should be performed under aseptic measures sufficiently convincing to permit wound closure without drainage. A plaster of Paris cast extending from the toes to the knee, exercising care that no pressure is exerted on the external popliteal nerve as it winds around the neck of the fibula, secures the foot in a flexed and adducted position. The cast is split soon after it has hardened and is allowed to remain for 4 weeks. A lighter cast is then substituted for another 4 weeks. After the removal of this cast, baths, massage, and passive motion are assiduously given, and 4 weeks later active weight-bearing is permitted.

The operative results which I have obtained in four patients who were suffering from old Pott's eversion deformity of the foot where the unfitness for work became the compelling cause for operation, were sufficiently successful to obtain from three-fourths to four-fifths normal functional efficiency.

THE SPOT-LIGHT IN SURGERY

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A PROPER lighting is important in any kind of manual work requiring clear visualization, care, and speed. To be most effective the light should be confined to the field of operation itself. The more the room and surroundings are lighted, the less plainly seen is the immediate area under observation.

This is particularly true in working in a recess. The head surgeons have learned this and use an illumination accordingly, but the general surgeons flood the operating room with intense light through skylights or overhead clusters of electric lamps in order to see a small area.

Williard Bartlett adapted the automobile headlight to the operating room in an effort to obtain a proper effect. This apparatus is cumbersome and a dust catcher, flooding the surroundings, including the surgeons, with light and heat. Its mirrors tarnish and still further diffuse the light. As a result of these things many modifications have been made. In addition, it is unnecessarily expensive. It uses a high voltage current (110-220 volts) and is not sharply focused so that it is dropped from the ceiling to intensify the light by its nearness.

A proper light should be sharply focused to a small area a little larger than the field of work; it should be bright; the mirrors should be durable; and the outfit as small and out of the way as possible.

To throw parallel rays of light from a mirror its surface must be parabolic and the source of light must be a point only. In using the ordinary city current the lamp must have a relatively long filament and hence the source of light cannot approximate a point. Such a lamp cannot be focused without much diffuse lighting and an intense light requires its nearness. If the current is lowered in voltage the filament may be reduced in length until it can be made of such a size as to be almost the needed point. With such a bulb and a proper mirror all the light can be thrown out in a well-limited beam, and it will be intense at long distances. This is a fundamental and extremely important principle.

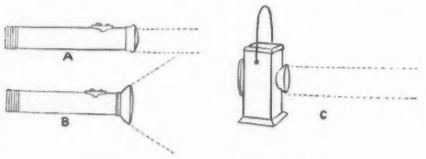

Fig. 1. *A*, Well focused flash-light (Eveready spotlight); *B*, ordinary flash-light with divergent rays. No sharp illumination at 3-foot distance; *C*, lantern (Delta) sharply focused; gives brilliant illumination at 10 feet and more.

The ordinary automobile spot-light answers the purpose admirably. It requires a current of 6 to 8 volts. To use the city current, a small transformer must be interposed in the circuit. It is adjustable in all directions, the bulbs easily replaced, the light easily focused. The mirrors are protected by the shell and glass in front so that they will last indefinitely. The outfit is easily obtainable of any electrician or surgical supply company and, finally, it is cheap.

In use, the field lighted is warmed, but this is a great advantage to the patient who is exposed and of no annoyance to the surgeon who is not.

Sharply focused portable lamps using dry-cells are now obtainable which are a great help when working in private homes. The ordinary "flash-

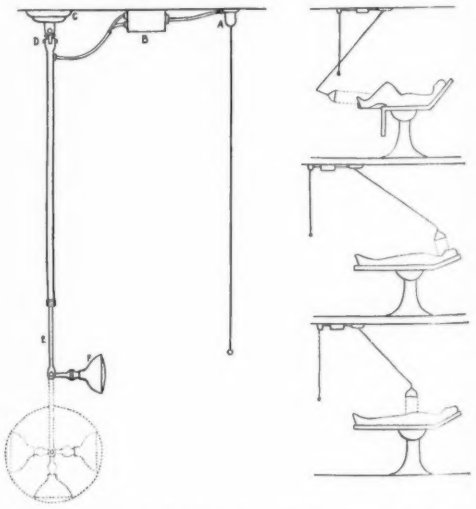

Fig. 2. Ceiling bracket for office use. *A*, Pull cord switch on feed line; *B*, transformer; *C*, base fastened securely to ceiling; *D*, universal joint; *E*, telescoping extension with range of 20 inches; *F*, small auto search light hung on hinge joint.

The rest of the figure shows the manner of its use. In the drawing the light is relatively too near the patient.

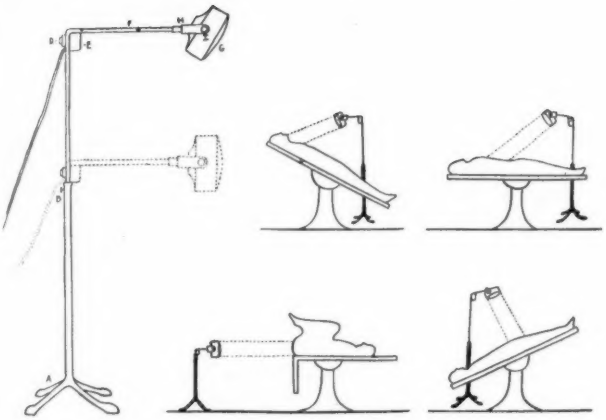

Fig. 3.

Fig. 3. Stand lamp for operating room. *A*, The stand should be heavy, and broad; *B*, adjustment screw by which the supporting arm is raised or lowered within a range of 3 feet; *C*, switch on feed line; *D*, transformer; *E*, extension arm 18 inches long; *F*, automobile search-light (Stewart). This is tilted at *I* and revolved at *H* to any position.

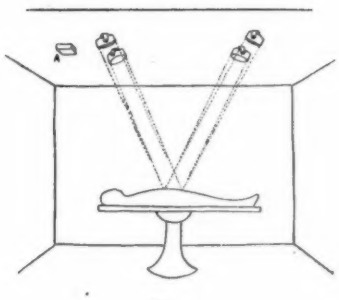

Fig. 4.

Fig. 4. Operating room equipment of four search-lights (Stewart) mounted directly on ceiling so as to be adjustable in direction. *A*, transformer.

light" is not sharply focused so that it has to be held too near the field for good surgical technique. One type, however, is sharply focused for long range use and has an adjustable focus which makes it very convenient. This may be used several feet away with advantage. It is suitable for emergencies, examinations, etc. For better illumination those of the larger type illustrated are very good. Two of these properly placed give a good illumination of an operation field.

For office work we use the long telescoping, adjustable ceiling bracket with a small, light spot-light. It can be adjusted to any position, it can be obtained in various lengths and it has a multitude of uses. It is fine for testing the eye reflexes (covering the lamp, not the eye), removing foreign bodies from the eye, for throat work, minor operations generally, and for vaginal and rectal illumination. In addition to all this it is a splendid light when used with a head mirror.

For a stand lamp in the operating room the apparatus is mounted on an adjustable stand. This makes a useful lamp for assistance in operating in the recesses of the body.

It has been suggested that the outfit can be mounted on a suitable bracket and used in one of the numerous sockets of the modern operating table.

For use as a ceiling light in the operating room four or more of these lamps can be mounted directly on the ceiling, focused to an area about 1 foot or more in diameter, and directed to a common center. The operating table is shifted if necessary to bring the field in this lighted area.

The lights are placed far enough apart so that shadows are practically eliminated. The focused rays of the different lamps should meet at an angle of 30° to 45°. These lights can be used to advantage even in the daytime.

Inasmuch as the light is so sharply limited it is necessary to have other ordinary electric lights to illuminate the room, the instrument tables, etc. One who uses such lamps for a time is well satisfied without a large skylight in the operating room.

Certain precautions are important in using these lamps on city currents. The switch control must be on the feed line before the transformer is reached. The transformer must be of suitable capacity to deliver the proper voltage. For one 32 candle power bulb requiring 6 to 8 volts, a transformer of 50 watts capacity is used.

For four ceiling lamps of similar character, one heavy duty transformer is used, reducing the current 6 to 8 volts. The lamps are wired in multiple and not in series. If one bulb burns out the rest will still function. Such a transformer should not be far from the lamps.

In using the single lamp a little experience is needed to find where it is placed to best advantage. For mastoid, vaginal, rectal operations, etc.,

the lamp should direct its rays over the operator's left shoulder (if right-handed). In goiter, deep pelvic and deep epigastric operations, the rays should light the field from a line in the center of the table as indicated in the drawings.

While we have not used such an apparatus, a head-light could be made upon the same principle which would be much better than any with which we are now familiar. It should be small, with an aluminum shell, a true parabolic mirror and filled with a suitable bulb. It would give a much better field than the usual type.

QUILTING THE REMAINING LOBE AS AN EMERGENCY PROCEDURE DURING THYROIDECTOMY FOR EXOPHTHALMIC GOITER

By HARRY G. SLOAN, M.D., F.A.C.S., Cleveland, Ohio

IT happens, in the experience of everyone operating on goiter of the exophthalmic type, that the reaction of the patient during operation exceeds the limits anticipated by the surgeon. This happens, in spite of the painstaking novocaine block of the operative field and gland. We have found this to be especially true in the instance of young, blond women. The clinical judgment of the operating surgeon must necessarily be the court of last appeal in deciding the type of operation and the proper time to do it. In spite of all the help he may bring to his assistance in coming to his decision, he finds himself every now and then to have decided not wisely. The reactions of the vascular system and respiratory rate give the only means of judgment, during operation, of the immediate condition of the patient and influence us in making our estimate of the severity of the postoperative reaction that reaches its height 36 hours later. When one partial lobectomy is completed the operator may feel that it is essential for the patient's safety to stop the operation. Three courses are open:

1. To pack the wound open. Here a secondary closure is necessary and a large proportion of the cases develop infection with its attendant prolonged drainage.

2. Simply to close the wound. It is more than likely that a second partial lobectomy will then be necessary to bring about a cure.

3. To quilt the remaining lobe and close. Three chromic gut sutures are placed so as to constrict the remaining gland in its middle, upper and lower thirds at right angles to its long axis. The gland is gently lifted forward and laterally and the encircling sutures placed by means of a slender curved needle, special attention being paid not to include the recurrent nerve. The sutures are tied quite snugly. The wound is then closed. This emergency procedure has stood us in good stead for 3 years and has so far resulted in a cure in each instance.

There is an additional essential procedure which we have stressed in our expectation of cure in exophthalmic goiter; namely, eradication of the infectious focus which we feel is the contributing factor to the activity of the disease. In 9 out of 10 instances, the tonsils are to blame; later in life it may be teeth, gums, sinuses, or some abdominal focus.

Severe cases of exophthalmic goiter are rarely cured by the removal of one lobe, and it is with this fact in view that we have aimed to put out of action, at one sitting, more gland tissue by our quilting procedure. The extra insult to the patient is minimal. The quilted lobe shrinks down so that it is often difficult to tell a year later which lobe was removed and which quilted. The practice has a limited application, but is well worth while because without further operation there is a likelihood of obtaining a cure.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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JULY, 1923

ACUTE INTESTINAL OBSTRUCTION

THERE is much current discussion on the subject of acute intestinal obstruction. Increasing attention is being focused on the methods of making an early and accurate diagnosis, the cause of death, and the treatment. These factors are of vital importance, since the mortality rate, as shown by numerous contributions to the literature, is entirely too high. Facts gleaned from experimental laboratories and from clinical observations should be correlated in order that we may make a united effort in combating the fearful existent mortality.

Acute intestinal obstruction would be a relatively benign condition were it always diagnosed immediately and prompt surgical intervention instituted. The mortality is in direct proportion to the time elapsing before operation is performed. In few conditions are the results of diagnostic error and delay so tragic.

In the last decade very little has been contributed concerning the symptoms and signs of this disease. Some contributions of great worth, however, have been made emphasizing the value of the X-ray, with or without barium in the intestinal canal, as a diagnostic factor. This examination may be made either with the fluoroscope or by a study of the X-ray plates. If the point of obstruction is in the large bowel, the haustral markings localize it immediately without the use of barium; but if in the small bowel, it is much more difficult to locate the obstruction. Barium administered immediately following a thorough gastric lavage, however, will in many instances be carried at once to the point of obstruction and enough of the substance will remain in position for a sufficient period of time to locate it accurately with either the fluoroscope or X-ray plate. This will enable us to perform many of these operations under local anæsthesia. It will save the immensely valuable minutes so frequently lost seeking the point of obstruction.

It is well to emphasize, also, the fact that the absence of gurgling, as determined by the stethoscope, can neither rule out a mechanical obstruction nor be relied upon as positive evidence of paralytic ileus. We have observed several instances of acute obstruction where very careful examination with the stethoscope at repeated intervals failed to reveal the slightest sound, causing dangerous delay in performing the operation.

Many theories have been advanced endeavoring to explain the cause of death. Among the factors emphasized in these theories are proteose intoxication, bacterial poisons, injury to the intestinal mucosa, and dehydration. No single theory seems to satisfy all conditions, due to the inter-relation of these etiological factors. Among the impor-

tant experimental observations is the demonstration of the action of the proteolytic intestinal bacteria in producing poisonous products.

The basis for the accepted modes of treatment rests on certain fundamental facts derived from clinical experience and laboratory investigation. It is a well-known fact, for example, that a complete strangulation of the small bowel causes extreme symptoms and marked shock, the severity of the symptoms and rapidity of the lethal outcome varying with the amount of bowel strangulated. Another striking clinical feature is the early and intense thirst. It follows that two important procedures to be carried out are the immediate relief of the obstruction and the administration of a sufficient quantity of fluids. Drainage of the toxic bowel contents is another factor of importance, especially in desperate cases where the cause of the obstruction cannot be quickly located.

In combating the toxæmia and dehydration, the copious administration of liquids by the subcutaneous, intravenous, and rectal routes is a life-saving measure. Free diuresis is essential in eliminating the poisonous substances from the blood stream. Ringer's solution is preferred for this purpose, as its diuretic action is superior to that of normal salt solution. These poisonous substances are absorbed from the bowel, it being freely admitted that the contents of the bowel above an obstruction or in an obstructed loop, are toxic. Many thousands of cases are on record, however, as being completely relieved by the mere removal of the obstruction. This seems to indicate that the bowel distal to an obstruction does not completely absorb the toxic products which are emptied into it after the obstruction is freed. It has been shown that the administration of large quantities of lactose will largely eliminate from the intestinal flora the proteolytic bacteria the action of which forms certain poisonous substances in the bowel. Though the administration of lactose by mouth or duodenal tube following operations for intestinal obstruction may not be practical, due to persistent vomiting, its use as a prophylactic measure might seem rational following operations for inflammatory intra-abdominal lesions where the subsequent occurrence of a paralytic ileus is not unlikely.

Before any operative procedure is undertaken, gastric lavage should be instituted until the distended stomach and bowels are fairly empty. This facilitates the ease of operation and removes much of the toxic material. Keep the patient warm. Give fluids freely and transfuse those severely ill. These are universally recognized essentials.

Relative to operative treatment, the surgeon must be careful not to be carried away by the belief that any one course of procedure is wholly right or wholly wrong. At the present time there is a marked divergence of opinion as regards the value and location of an enterostomy. Some hold that the enterostomy should be performed high in the jejunum; some prefer it at the obstruction; some perform it anywhere above the obstruction; while others favor freeing the obstruction in all cases, instituting any other necessary operative procedure at the same time.

Enterostomy is performed by many at the present time because apparently hopeless cases have recovered following its use. There are, however, some dangers in this procedure and we do not believe it alone is sufficient in all cases. It must not be supposed that an enterostomy will sidetrack all material from the bowel below, because many of us have seen fæces collect in the rectum and sigmoid below a colostomy, where the two stomata are side by side. Since this can occur with such complete severance, is it not much more

likely that bowel contents will pass beyond the enterostomy? An enterostomy does not entirely obviate the possibility of the constricting agent causing gangrene and perforation, with peritonitis or abscess at the constricted point. Furthermore, the operation for the closure of a fistula is not a simple procedure. Particularly dangerous and difficult are colon fistulæ in an emaciated patient where the fistulous tract is short. For these reasons we should not be carried away with the idea that fistulæ must always be made in obstructions of the bowel; careful judgment must be used. If the patient is in fair condition, one should relieve the obstruction and, when necessary, resect, if it can be speedily done, using a deep-lying Witzel fistula above to avoid the temporary paralysis at the point of resection. If the patient is of the almost hopeless type so frequently seen, by all means make a fistula at the most convenient point, preferably one by the Witzel method, or any other that will make a long tract, as fistulæ close in inverse ratio to their length; the longer the fistula the quicker the closure.

WILLIAM R. CUBBINS.

THE GRADED OPERATION IN THORACIC SURGERY

WHEN one has witnessed death following a brief illness, a relatively trifling accident or a minor operative procedure, even so trivial as a needle puncture, one is inclined to feel that life may indeed hang by a thread. Yet he who studies conditions of disease has occasion frequently to marvel at the extraordinary resistance of the human organism to infection, and its adaptability to structural changes of sufficiently gradual onset for the defensive or adaptive mechanism to act. The principle involved in the gradation or division of a surgical procedure into stages is based fundamentally on this adaptability. The graded operation in all major surgical conditions to which it has been applicable has yielded a minimum mortality and has extended operability to otherwise hopeless conditions.

In abdominal surgery the graded operation has been of great value in lessening surgical shock and in limiting the spread of infection, as for example in the Mikulicz operation for resection of the bowel. In resection of the stomach and rectum, and in operations for acute infections and intestinal obstruction, the indications for graded operation are similarly based on lessened shock and limitation of infection. Ligations and single lobectomy for hyperthyroidism and suprapubic cystostomy preliminary to prostatectomy are other familiar examples.

In major operations on the thorax there are also hazards due to infection and shock. Furthermore, the pleural cavity contains no such mechanism for defense against infection as the omentum, and many of the patients are in such relatively poor condition that serious postoperative shock is prone to follow an extensive single-stage operation. Another and even more important indication for the graded operation in thoracic surgery is the possibility of serious embarrassment of respiration and circulation. The function of the gastro-intestinal tract may be suspended for days, but the efficient function of the heart and lungs, two of the three organs constituting the "tripod of life," cannot be seriously interfered with, even momentarily, without endangering life.

A two-stage operation affords the greatest safeguard against spreading infection in the drainage of pulmonary and subdiaphragmatic abscess. The chance for fatal mediastinal infection following resection of diverticula of the cervical œsophagus is similarly lessened. Shock can be avoided in the most extensive

extrapleural thoracoplasties for tuberculosis and bronchiectasis by dividing the procedure into as many stages as the condition of the patient may demand. Such gradual collapse also allows the intrathoracic organs to accommodate themselves by degrees to changes in intrathoracic pressure, and lessens the tendency to retention of the septic purulent pulmonary secretions. Moreover, the patients do not object if the whole procedure is rendered relatively painless, as it may be, without additional risk, by careful local and regional anæsthesia combined with nitrous oxide and oxygen analgesia, and by alcohol injection into the nerve trunks to minimize postoperative pain. In chronic empyema, particularly in cases of long standing, and in those in which the cavities are large, shock and serious postoperative sepsis are largely avoided and the postoperative mortality greatly reduced if preliminary drainage and irrigation are followed by graded thoracoplasty. In extensive resection of a tumor of the chest wall in lobectomy for pulmonary suppuration, and in extensive resection of the thoracic œsophagus for carcinoma, shock, infection or embarrassment of respiration and circulation, or as usually is the case, all these factors combined, have resulted in an almost prohibitive mortality. Substantial progress in such extraordinary difficult fields seems hardly possible until the operative hazards have been reduced to a minimum. The graded operation is proving a means to this end. C. A. HEDBLOM.

MASTER SURGEONS OF AMERICA

JAMES BELL

THE death of James Bell on April 11, 1911, was no less a surprise than a shock to the large circle of his friends and admirers throughout Canada and the United States; a shock naturally, but a surprise also, in that the cause of his death was appendicitis, a malady the treatment of which he had been one of the earliest in Canada to establish on sure and safe foundations. It was one of those retrocæcal and gangrenous forms causing acute toxæmia, without clear localizing signs, which kill within a few days. His illness indeed lasted only 6 days. Of its kind it was a tragedy. He had been in perfect health, and, though no longer young (he was in his fifty-ninth year), he could still look forward to not a few years of useful work. His unusual skill as an operator was unimpaired, and his judgment, always sound and now ripened by great experience, was at its height. His reputation was no small one on this continent, and was still growing. Always quiet, unobtrusive, and essentially modest, he was nevertheless full of a clinical wisdom which made all that he wrote or said upon surgical subjects immediately attractive and arresting in the minds of the thoughtful. Few were his words but clear his vision. In diagnosis he was quick, accurate, always steady, and frequently brilliant; and this through a certain gift of intuition, meaning thereby that he seized immediately on the essential, and refused to be diverted by the unessential. On the therapeutic side, he was slow to operate but quick in operating; and, the operation once begun, his judgment in determining what to do and what not to do was extraordinarily sound. His technique, at a time when technique was not so carefully considered as in these latter days,—not considered, let us say, the be-all and end-all of surgery, was almost flawless; and his results in wound healing equalled those of the present day.

In person he was largely built, athletic, and had the fair hair, the ruddy cheeks, and the blue eyes of the North man. A noted boxer in his youth, and a rider to hounds in his middle years, he retained a large measure of his great physical endurance to the end of his life.

In character, James Bell was distinguished particularly by a straightforward honesty, without, however, anything of the simple in it, which went at once to the heart of a matter, scientific or other, and brooked no devious road. "Bell's sniff" was a thing widely known. It signified disagreement, and even a certain impatience, not often amounting to contempt (for he was on the whole inclined

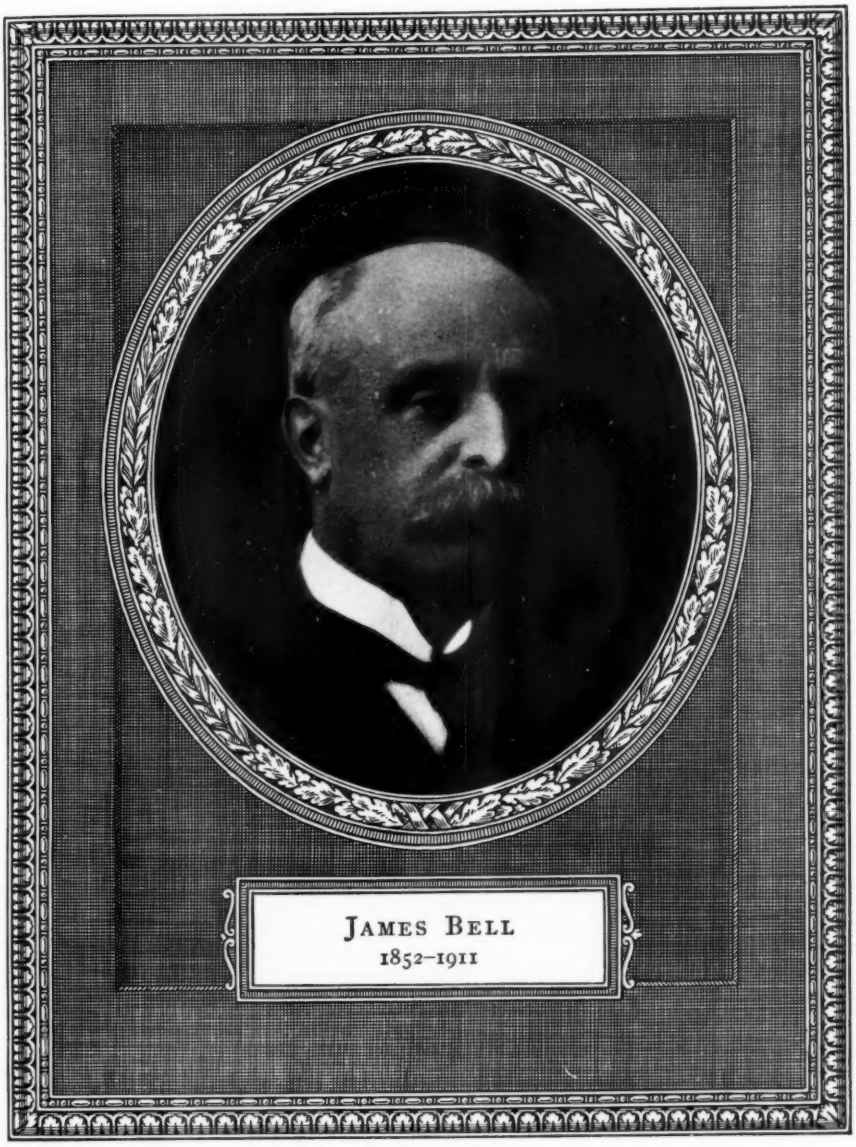
to be tolerant and generous toward the opinions of others), with a view or an action that seemed to him not quite straight or worthy. And his sniff was often followed by a remark so concise, so apposite, and so pregnant that it lodged in the hearer's memory and became a "mot,"—a thing to be quoted.

It was that same habit of straightforward and incisive outlook, which made him the excellent diagnostician that he was. His diagnoses were of prose rather than of poetry; they ran along the lines of sober probability rather than those of imaginative possibility; and the findings at operation often left the imaginative junior somewhat discomfited. That indeed was the best part of his training of the house surgeon, a training which in Bell's eyes aimed at two things: to make of the house man a good surgical pathologist and a precise observer and recorder. Beyond that it hardly proposed to go. And in that insufficiency lay perhaps the one defect in Bell's life as a surgical chief.

In his personal relations he was courteous to all, the friend of many, the beloved of a few. There are those whose facile popularity embraces a large part of their own world, and there are those who maintain a certain reserve toward the crowd but save a deep affection for the few. Of the latter was James Bell; and of such it may be said that their value to the world, whether as friends, as workers, as teachers, or as exemplars generally, is perhaps the greater for these qualities.

Dr. Bell was born in North Gower, Carlton County, Ontario, on October 10, 1852. Brought up on a farm, he never lost his love of the land and the things of the land; his love of horses especially remained strong throughout his life. He owned a small farm a few miles outside of Montreal, and thoroughbreds were his hobby. One can easily imagine him living another score of years, and firmly, to the very end, showing motor car salesmen to the door within a minute of their appearance.

In the year 1874 he was entered as a student in the McGill Medical School, and was graduated in 1877, winning the Holmes gold medal. He then entered the Montreal General Hospital as house surgeon, and was shortly made medical superintendent, in which capacity he served for 8 years. In 1885 Montreal was visited by a serious smallpox epidemic. At that time such cases were still treated in the hospital, and one of the first articles published by Dr. Bell was upon his experience with this disease. In this year also he accompanied General Middleton to the West, on the Riel Rebellion Expedition; did active duty in the field as surgeon major in charge of the hospital corps, and was mentioned in despatches. In 1886 he was appointed one of the attending surgeons of the Montreal General Hospital, and the next 8 years saw many articles from his pen, mostly in the form of interesting case reports upon the subjects which were then considered new, such as appendicitis, the Thiersch method of skin grafting, the suture of the fractured patella, urethral fever, kidney tumors, gastro-enterostomy, perforated



JAMES BELL
1852–1911

typhoid ulcers, the Hartley-Krause removal of the gasserian ganglion, and others. Most of these papers were published in the *Montreal Medical Journal*.

In 1888 he was made associate professor of surgery in the Medical School of McGill University.

In January, 1894, the Royal Victoria Hospital was opened. Built and endowed through the generosity of two famous Canadian citizens, Sir Donald Smith (later Lord Strathcona) and Sir George Stephen (Lord Mount Stephen), and situated on the slopes of Mount Royal commanding a most beautiful view over the city and the River St. Lawrence, it stood out, from the first, as one of the most attractive hospitals on this continent. The chiefship of the surgical department was confided to the late Sir Thomas Roddick, but within a year Sir Thomas retired and was succeeded by Dr. Bell, who at the same time was made professor of clinical surgery. These positions he held until his death.

The opportunity was a great one. Indeed, one might see no other on this continent comparable with it, save at The Johns Hopkins. It was the opportunity, as sole chief of a large surgical clinic, to found a real school of surgery.

In these latter days, when the waters of medical education are being so strongly stirred by winds of discussion, it may not be amiss to relate Bell's plan for the training of the internes of his service. That plan contemplated, briefly, a graded 4 years' course, consisting of a first year in surgical pathology and the outdoor, 2 years of case reporting in the wards, and a final year as resident surgeon. Followed out, it meant the development of a real training school for young surgeons. And this was in 1894, when nowhere else on this continent, if I am not mistaken, save under Professor Halsted at The Johns Hopkins, was there to be seen anything approaching it in ambition and bold design. The result was that his men left the hospital well trained in surgical pathology, in thorough case reporting, in diagnosis and prognosis, and with a reasonably good experience in the mechanics of surgery.

The two medical schools of The Johns Hopkins and McGill were much alike, save in the trifling matter of worldly goods. The Edinburgh tradition in teaching obtained at both places. In each there prevailed the system of clinical clerkships and dresserships, with free access to wards and patients allowed, nay, imposed upon the students,—a system which was conspicuously absent in American schools at this period, when University hospitals were almost unknown. A close bond of union lay in Osler, who had gone to The Hopkins from McGill by way of Philadelphia. Pathology was considered to be the proper groundwork for a scientific surgeon. This attitude toward the training of the young surgeon was shared by Dr. Halsted and Dr. Bell, and the two men in scientific outlook, in ambition, in methods of teaching, and in a recognition of the value of laboratory work, were much alike, although the building of the Hunterian Laboratory gave Baltimore a great advantage. The school of young surgeons which was developed

at The Johns Hopkins during the last 25 years, under Professor Halsted, as the result of a conscious and studied policy of generosity and stimulation, has been the admiration of the medical world, an admiration which is cordially shared by the McGill school.

As to Dr. Bell's literary output, one may merely say that, from 1888 to the time of his death, no year passed that did not see one or more articles from his pen; and his range was very wide. While practically all of these were clinical articles the pathological side was never neglected.

He was possessed, moreover, of an excellent style in the use of English,—a style without ornament, it is true, yet graphic, and withal concise. His articles were never long, but they contained much. "Hard writing makes easy reading," and any paper of Bell's read easily. An earnest and constant student, he was always abreast of the times, and occasionally made, on the basis of his reading, a diagnosis that astonished those who worked under him. Take as an instance the case of a young girl in the clinic, who was found to have a large movable tumor in the epigastrium. His diagnosis of hair ball in the stomach, made almost in a moment, and verified by operation, was the first instance in a series of some twenty recorded cases in which the diagnosis had been made before operation. Again, at a time in the first years of the century, when actinomycosis on its clinical side was but little known in this country, Bell published (1905) a series of 13 cases involving various parts of the body. His experience in the radical operation for laryngeal cancer was unusual, and in 1909 he read a valuable paper on this subject before the American Surgical Association, giving his results in twelve laryngectomies and three thyrotomies. Nor were his judgment and his progressiveness evidenced only in doing the newer things in surgery; they were also occasionally shown in his not doing them. Upon one occasion he jocularly remarked to the writer that he expected before long to earn the distinction of being the only man on this continent who had not done an orchidectomy for hypertrophy of the prostate. He was also the first on this side of the water, if I am not mistaken, to drain the ventricles into the subdural space in cases of internal hydrocephalus, an operation which at the time (1897) seemed to have a sound physiological basis in Leonard Hill's work. Though we have since learned that the idea is physiologically erroneous, the fact nevertheless illustrated Dr. Bell's keenness in the direction of scientific surgery.

That keenness he never lost. And if one were to estimate his value to the world, or to that part of it of which he was the center, one would be inclined to say that it lay above all in the influence which his keenness, his industry, his honesty, and his progressive conservatism exercised upon those who worked with him and under him. A man's immortality lies in what he bequeaths of his own spirit to the younger generation. In this sense the memory of James Bell achieves permanency even more than through his published work. EDWARD ARCHIBALD.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JANUARY 19, 1923, DR. RUDOLPH W. HOLMES, PRESIDING

KNOTS OF THE UMBILICAL CORD; DERMOIDS IN PREGNANCY

DR. RUDOLPH W. HOLMES: It has happened twice in my life that I have lost a baby from knots in the cord, and I have seen perhaps a half dozen cases. This morning I delivered a baby with two true knots in the cord, the baby being born alive.

A recent writer stated that dermoids in pregnancy were rather rare. I cannot believe that because I have had four dermoids now. This specimen comes from a girl, a primipara, and was in the pelvis and prevented the baby from descending. A cæsarean section was done and the baby removed. The girl has a cystic ovary but we left it because it was soft and was evidently not a dermoid. She is 22 years old.

DR. N. S. HEANEY: I would like to know whether the ovary was incised to see if there was anything of a dermoid nature.

DR. HOLMES, closing: The mass was soft and not large and she was so young we thought it was best to leave it alone.

MASSIVE COLLAPSE OF THE LUNG

DR. JOSEPH L. BAER: I recently had a rather rare accident complicating pregnancy. The patient was a primipara, 26 years of age, whom I saw in mid-pregnancy. She than had a tumor growing into the left broad ligament which was so large that it completely blocked three-quarters of the inlet, reaching into the true pelvis below the level of the ischial spine, extending into the abdomen about 8 centimeters above the symphysis and displacing the pregnant uterus to the right and above the umbilicus. I let her go to full term and did a cæsarean, making a rather high incision. The operation was entirely uneventful except for a rather brisk post-partum hæmorrhage, the uterus contracting very slowly and poorly. The empty corpus sat on top of the immense fibroid. The patient went to bed with rather a rapid pulse (130) but otherwise in good condition. For 24 hours she did fairly well except that she had a slight cough and was rather troubled with mucus in the throat. Forty-eight hours later the pulse became very rapid (168), she became pale, with cyanotic nails and showed some dyspnœa, but she did not complain. There was no evidence of hæmorrhage, embolus, acute cardiac, or gastric dilatation. Necrosis of the fibroid due to disturbed circulation following labor was considered. Moist râles appeared at both bases that afternoon. Temperature 101, pulse 168, white blood cells, 23,000. Tentative diagnosis, beginning pneumonia.

The following day, 4 days after delivery, Dr. J. C. Friedman made a diagnosis of collapse of the entire right lung. An X-ray picture was taken at that time, another 2 days later, and a third 2 weeks afterward. As you can see, the right chest contains no air. The diaphragm level is very high. The heart is displaced so far to the right that at first we thought we were looking at the film reversed. Within 24 hours of the time this picture was taken the lung showed aeration and within 2 weeks it was restored to complete health. (Figs. 1, 2 and 3.)

The first writer who gave any systematic account of massive collapse of the lung was Pasteur, who, in 1914, described massive collapse following all sorts of operations. The most recent work has been done by John Rose Bradford. Certainly obstruction of the bronchus is the easy and simple explanation of the collapse of the lung. This patient had one vomiting spell on the table but having had nothing to eat there was nothing to aspirate. Bradford believes that the most likely etiology is a complete immobility of the side that is to be affected, the immobilization being due either to pain or some extraneous factor. With complete immobilization there results a secondary collapse of the lung on that side.

Surgeons in the war had a large experience with this subject. They found, for example, that a slight injury of the chest wall, non penetrating, could produce collapse either on the injured side or on the opposite side, the collapse being partial or complete.

CEREBRAL EMBOLUS NINE DAYS AFTER LABOR

DR. W. M. THOMPSON: I want to report a case of cerebral embolus 9 days after labor. The patient was 24 years old and this was her first baby. She had had an uneventful history until 2 weeks before labor when she began to have a great deal of œdema of the lower extremities. A large amount of albumin with no casts in the urine led us to believe that it was pressure œdema. She went into labor and was easily delivered with low forceps at 1:45 p.m. At 3 o'clock her temperature was 100.4° F., her pulse had risen from 78 to 104, and the respiration was 22.

Fig. 1. Massive collapse entire right lung four days after cæsarean section. Note the absence of air in right chest. Displacement of heart to right. Elevation of right diaphragm.

Fig. 2. Same, 6 days after operation. Beginning aeration of right lung. Heart returning toward left, shown by relation to skeleton and decreased distance from apex to left chest wall.

Fig. 3. Same, 2 weeks after operation. Note the almost complete aeration of right lung. Right heart still somewhat dilated.
(Dr. Baer's case.)

In 3 hours her temperature was normal and continued so. On the ninth day, December 21, 1922, I saw her at 10:30 a.m. At 11 a.m. I was called by the interne and told that the patient was in collapse. When I arrived I found these symptoms: The patient was unconscious, the face pale, the breathing sterterous, the eyes open, pupils deviated to the right, the body was flaccid. Within 3 hours she became partially conscious and could answer some questions.

The hemiplegia involved the whole of the left side. In the last few days there has been a noticeable improvement in the left leg both in the flexors and extensors and in the flexors of the left arm. Unless there was some abnormality of the heart, either a patent foramen ovale or a defective ventricular septum, this clot could not have come from the pelvis. The fact that none of the examining physicians have detected any abnormality in the heart sounds and the history of acute inflammatory rheumatism in childhood led me to believe that this focus came from the endocardium. Pulmonary embolism following childbirth is not uncommon but this cerebral embolism 9 days postpartum is, I believe, very uncommon.

Dr. Emil Ries: If a blood clot travels into the lung and disintegrates into small particles there, these particles could pass through the lung only if of the size of the very smallest capillaries of the lung. That size would hardly suffice for an embolus.

SPONTANEOUS VERSION FROM CEPHALIC TO BREECH PRESENTATION IN A PRIMIPARA

Dr. Irving F. Stein: I desire to place on record an obstetrical observation. A primipara, 34 to 36 weeks' pregnant, experienced rupture of the membranes during the night of December 29. She came to the hospital on the 30th, not in labor. Examination revealed a cephalic presentation, the head being at the inlet and movable. An X-ray taken at that time checked the findings on external examination. The patient was kept quietly in bed under observation for the next 3 or 4 days. On the morning of the fourth day she reported a great deal of motion of the fetus and began to have contractions every 15 minutes. Examination at that time revealed a hard mass in the fundus and the uterus was considerably smaller than it had previously been; there was now a breech presentation. X-ray picture taken January 3 verified the diagnosis. I delivered her that evening of a 5-pound baby, double-footling presentation.

I believe it is extremely rare, if not unique, for spontaneous version to occur in a primipara from a cephalic to a breech presentation within a few weeks of term, 3 or 4 days after rupture of the membranes.

Dr. W. George Lee: What proof have we for rupture of the membranes? We have no statement as to the condition of the membranes during delivery or at that time.

Dr. Stein: In answer to Dr. Lee, I will say the rupture of the membranes was a true spontaneous rupture, and the birth was practically a dry one.

ETHER LAVAGE; ITS LOGICAL USE LOCALLY AS AN ANTI-AGGRESSIN

Dr. George de Tarnowsky presented a paper on ether lavage. (See p. 76.)

DISCUSSION

Dr. Arthur H. Curtis: In the technique of ether administration, is the abdominal cavity almost

Fig. 1. Roentgenogram taken 12 hours after rupture of membranes, dorsal posture, cephalic presentation.

Fig. 2. Same as Figure 1, lateral posture, postero-anterior. (Dr. Stein's case.)

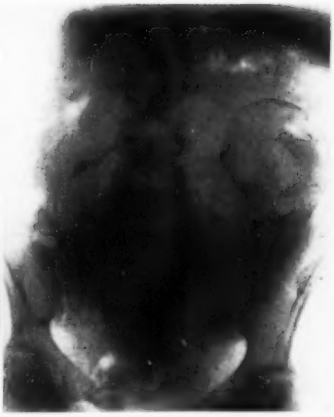


Fig. 3. First stage of labor. Prone posture, breech presentation, 4 days after rupture of membranes.

closed and ether poured in, and is the dosage about 1 ounce?

Dr. Tarnowsky: The dosage of ether is about 1 ounce. I always start closing the peritoneum and then pour the ether in so that closure is effected before it begins to volatilize to any extent. Otherwise one loses most of it as a vapor. (Discussion on paper of Dr. de Tarnowsky.)

Dr. W. M. Thompson: I have seen a great deal of ether used, in joints more than in the abdominal cavity, and in the large number of cases that came before us in the Great War, an inconceivable number, one's observations could not be very accurate. We were groping for something to stop the infection. Flavine came out and that was tried. The Carrel-Dakin treatment came out and that was tried, but there were no sufficiently accurate observations in the organizations I was in contact with to get a really definite conclusion. I do know this, that a good many men in the British Army used ether and seemed to feel it was a great help, particularly in the joints. We used a great deal in the knee joints but I, myself, became more skeptical toward so-called antiseptic fluids as time went on and came to feel that I must clean out blood clots and débris, wash out with sterile water, and then close. I am very glad to hear such a definite statement from Dr. de Tarnowsky.

Dr. Charles B. Reed: I wish to have the Doctor emphasize his technique, for his use of ether in the prevention of adhesions.

Dr. George de Tarnowsky (closing): Answering Dr. Thompson's statement, of course ether will not take the place of any proper surgical procedure and for this reason every surgeon in the war realized that if proper surgery could be carried out everything else was unnecessary and that without proper surgery nothing is a complete success.

In regard to the use of ether in the uterine cavity, Lenhardt is the only one who has used it. I have not used it myself. The method he uses is very simple. He takes a small syringe and passes it into the uterine cavity in infections, and injects one-half to one ounce of ether. He prefers to warm the ether first. Preliminary warming does not appeal to me because ether volatilizes at body temperature anyway, but he seems to feel that if it is warm he gets better results.

SYPHILIS OF THE UTERUS AND ADNEXA

Dr. Bernard Portis presented a paper on: "Syphilis of the Uterus and Adnexa." (See p. 37.)

DISCUSSION

Dr. Wm. H. Rubovits: I saw this woman upon her admission to the Gynecological Ward of the Michael Reese Hospital. She was quite well nourished but anæmic, and seemed quite ill. Examination revealed nothing in the external genitals, nothing in the vagina, but a very large cervix which was soft except in the lower lip which was the site of an ulcer occupying about one-fourth of the area of the lower lip. There was nothing on the anterior lip. The size of the cervix was more than twice normal. The ulcer was indurated. Bimanual examination revealed, uterus only slightly enlarged with thickening in the adnexa. I felt justified in making a diagnosis of beginning carcinoma; the possibility of its being a luetic lesion did not occur to me. The removal of the organ was attended with difficulty that I had never experienced with a similar operation. The separation of the bladder from the uterus was very difficult, as well as the separation of the organ posteriorly. It was very bloody. There were apparently no lines of cleavage.

DR. W. A. BRAMS: This report is very interesting and appears to be absolutely verified by the finding of the spirochætæ. I should like to ask several questions about the different histological verifications of syphilis of the walls. Which parts of the walls were syphilitic and what was the nature of the involvement? I should also like to ask what were the changes in the veins which were considered as specific of syphilis in other parts of the body? I would also like to know if there were any other demonstrable syphilitic lesions.

DR. THOMAS J. WATKINS: Syphilis of the uterus is apparently of relatively infrequent occurrence. This is surprising as the uterus frequently harbors a syphilitic child and a syphilitic placenta. I can recall having seen only five cases of syphilitic uterus. It is logical to assume that syphilis of the uterus frequently occurs without being detected. In case of suspected chronic syphilis in the pelvis, my experience would suggest that a therapeutic test is far more valuable than a Wassermann test.

DR. EMIL RIES: Syphilis of the female sexual tract above the vaginal epithelium is unknown. Dr. Portis' case is a case of syphilis of the vaginal epithelium on the outside of the uterus, of the vaginal portion. That from there syphilis may invade the body is perfectly feasible but that does not make it syphilis of the uterus but a systemic infection of syphilis.

This report opens up many questions: for instance, that of the diagnosis of a doubtful ulcer on the cervix. Ten years ago a microscopical examination of the lesion would have settled the question of carcinoma quickly. Recently the edict has gone out that we must not remove a portion of a doubtful ulcer because these patients will all die, if a cancerous ulcer has been partly excised. That is a pernicious teaching. I have removed sections from numbers of patients on whom removal of the carcinoma has been performed subsequently and who are alive 10 years or more after the operation. Another point brought up by the report is this: suppose this case had been operated upon and the pathological examination had not been carried out with the tenacity of the Michael Reese staff, then this case would have gone on as carcinoma of the uterus cured and would have built up the statistics of vaginal hysterectomy for cancer. The practice of using X-ray and radium without obtaining microscopic diagnosis and then building up statistics of results without proper pathological examination is to be condemned for the same reason. All such statistics will be without value because not substantiated by proper microscopic investigation.

DR. BERNARD PORTIS (closing): I agree with Dr. Ries that a section should be removed from doubtful lesions of the cervix and a frozen section, or, better, the usual fixation methods should be used in order to determine the exact pathological process present. I had two cases of syphilis of the cervix while I was associated with Drs. Barrett and Culbertson at the Cook County Hospital. The diagnosis in those cases was made from tissue removed for histological study and the finding of a positive Wassermann reaction in the blood. We examined sections from the cervix, and corpus uteri, and ovary, but did not find any changes which we considered as pathognomonic of syphilis but rather that of a subacute diffuse interstitial involvement of the uterus and ovaries. It was only upon finding the spirochætæ in these two organs that we were certain of the correctness of our diagnosis. This was further substantiated by the development of a secondary skin eruption in the patient, and a positive Wassermann reaction in the blood.

Dr. Brams has asked if there were any changes in the arteries and veins which might be interpreted as due to a syphilitic involvement. After careful study of the changes in the arteries and veins, we concluded that the existing vascular involvement was that which one usually finds in the uteri of women past middle age. We could not demonstrate any definite mesarteritis, endarteritis, or a perivascular lymphocytic infiltration.

AMERICAN COLLEGE OF SURGEONS

SUMMARIZED REPORT OF THE COMMITTEE ON SCIENTIFIC MEETINGS OF THE *VANDYCK* CRUISE TO SOUTH AMERICA

By JAMES M. PATTON, M.D., F.A.C.S., Omaha, Nebraska, Recording Secretary

THE material in this article represents a summary of the scientific papers and discussions by the members of the recent cruise of the American College of Surgeons to South America. A summary of the activities of the Head Surgeons will appear in a subsequent article.

The meetings covered by this report were an important factor in providing scientific entertainment for the surgeons on board the S.S. *Vandyck*. They were organized and carried out under the direction of Dr. Charles D. Schaeffer, of Allentown, Pennsylvania, Chairman, and Dr. James M. Patton, of Omaha, Nebraska, Secretary of the Committee on Scientific Meetings, to whom, and to the other members of the Committee, the credit for the success of the meetings must be given.

MANAGING EDITOR.

The Executive Committee for the South American cruise of the American College of Surgeons appointed the following Committee on Scientific Meetings: Dr. Charles D. Schaeffer, Allentown, Pennsylvania, Chairman; Dr. Hugh H. Young, Baltimore, Maryland; Dr. A. J. Crowell, Charlotte, North Carolina; Dr. James T. Case, Battle Creek, Michigan; Dr. John Osborn Polak, Brooklyn, New York; Dr. T. Casey Witherspoon, Butte, Montana; Dr. G. A. B. Addy, St. John, New Brunswick; Dr. James M. Patton, Omaha, Nebraska, Recording Secretary; Dr. John George MacDougall, ex-officio, Halifax, Nova Scotia; and Dr. Franklin H. Martin, ex-officio, Chicago.

TREATMENT OF DEEP-SEATED CARCINOMA

The first meeting under the direction of the Committee was conducted on the evening of February 16, when Dr. Emil G. Beck, of Chicago, gave a most interesting address on "What Can be Done for Apparently Hopeless Cases of Carcinoma?" Dr. Beck emphasized the fact that surgeons and roentgenologists must co-operate in this work if they expect results. While superficial cancer may be cured by X-ray, deep-seated cancer cannot be cured by this treatment, because we cannot deliver into the seat of the tumor sufficient dosage of radiation without injury to the overlying or surrounding tissues; by subjecting the patient to such large doses as would be required to affect the growth, a roentgen toxæmia would be produced, which might kill the patient.

There is a method which makes the large dosage unnecessary and prevents the toxæmia. The deep-seated tumor, when feasible, is transformed into a superficial one, and the exposed field treated directly in the seat of the disease by exposure to radiation or insertion of radium into the bed of the disease. This method consists in the surgical removal of all overlying tissues, such as the skin, muscles, and bone, and as much of the tumor as is accessible or feasible. This leaves the wound fully exposed. No suture material whatever is used.

After the carcinomatous tissues have been eliminated, the wound will begin to contract, and gradually the skin from the edges will begin to regenerate and finally cover the entire denuded surface. The epithelization is further enhanced by adhesive plaster strips placed on the granulating border. The author has treated more than 160 cases by this method. His lecture was illustrated with slides showing all stages of the operation and the final results.

Dr. John P. Munroe, of Charlotte, North Carolina, presented an instructive discussion on heart lesions. He spoke particularly of the various phases of auricular fibrillations, heart block, etc., and while presented from the standpoint of the internist, it was of marked value and interest to the surgeons.

THE KIELLAND OPERATION FOR UTERINE PROLAPSE

Due to stops at Panama and Cartagena, no further scientific meetings were held until the evening of February 22, when Dr. Hermann J. Boldt,[1] of New York, gave an address, with illustrations, on "Operation for Uterine Prolapse, Devised by Dr. Christian Kielland of Christiania, Norway."

The object of the operation is to place the uterus, in its entire length, on the anterior surface of the vaginal wall, and to narrow the vaginal caliber.

The first step is to pull the uterus with a pair of bullet forceps to its fullest extent, outward and upward. A small wedge-shaped excision of the pos-

[1] For complete paper see Surg., Gynec. & Obst., 1923, xxxvi, 742.

terior lip is made, which, in ordinary cases, need not be wider at its base than half a centimeter. The incision is continued on either side downward for a distance of from 6 to 8 centimeters, gradually diverging. The flap is separated from the underlying structure, but not cut off; it is used for traction when the cervix is to be inverted. The width of this flap must necessarily depend upon the size of the prolapsus. On either side the vaginal mucous membrane is now separated a sufficient distance to grasp about half way, or in some cases even a trifle more, around the organ with the finger. When this has been done, one may begin to close the posterior wound, starting at the external opening of the vaginal portion, with a continuous catgut suture, taking in the stitches only the mucous membrane, and closing the wound to within about half a centimeter of its terminus, where the suture is tied but not cut off, since it may be desirable to use it later for traction purposes, when ready to invert the cervix.

We are now ready to operate upon the anterior wall. The organ is pulled downward, and the oval flap incision started about one-fourth of a centimeter beneath the urethral opening, which thus eliminates the urethral redundancy; it is carried downward, and a small wedge is excised from the anterior lip of the vaginal portion of the cervix. The exsections here, too, depend upon the size of the parts operated upon. It is understood that the excision from the portio vaginalis must be larger in the case of a voluminous, mushroom-like vaginal portion, than from one of normal size, since it is necessary to make a conically shaped portio, or else one will fail to invert the cervix.

When the flaps have been excised the vaginal mucous membrane on either side is separated the required distance. In the upper part the separation must be a trifle more, since this part of the vagina is used to cover the anterior surface of the uterine body. With this part of the intervention finished, we are ready to separate the bladder in the customary manner. But in the Kielland operation it should not be done so extensively laterally as in the Watkins or the Schauta Wertheim operation. One should be careful not to injure the bladder pillars of Luschka.

Now, with a pair of bullet forceps the body of the uterus is brought out and the fallopian tubes are either tied, or a small section, near the cornua, excised, to sterilize the woman, if she be still in the childbearing period.

The bladder peritoneum is attached to the posterior surface of the uterus at about the corporocervical junction. The uterus is placed in the position which it is henceforth to have, and a small drain is placed down to the corporocervical junction and brought out at the upper wound angle. After this is done the wound is ready for closure.

This, in a larger number of cases, is best done in two stages. Beginning at the external opening of the lip of the portio vaginalis, one sews upward to just above the corporocervical junction, but in this suturing one must also include the muscularis of the cervix. When this has been done, the cervix is ready to be inverted.

With the index finger of the right hand one pushes up the cervix, while simultaneously one pulls with the fingers of the left hand upon the flap left on the posterior wall, or on the suture left long, or possibly both. When the cervix has been inverted, which is usually readily accomplished, if it has been properly shaped, the distal half of the work is finished, and one feels, upon examining, only the anterior lip and the opening of the cervical canal. The rest has become obliterated to touch.

The rest of the wound is now closed. The sutures should, at least every second one, include also the muscularis of the body of the uterus. The first one is placed not higher than the origin of the round ligaments—never at the fundus, or on the posterior surface.

When the uterus is of senile size, or when the prolapsus is small, the anterior wound may be closed with a single catgut suture, but, as previously intimated, the two-stage closure is more convenient for most cases.

After the anterior wound has been closed, the pelvic floor is next given attention. The flap and the suture are now cut off, and the incisions continued where they were left off, making the Hegar denudation and subsequent closure. The drain is removed about the third day.

Kielland asserts that he has not seen a recurrence in more than 150 operations, if the proper selection for the operation has been made. He has been doing the operation more than 10 years.

The fact should be emphasized that all operations devised are of benefit in properly selected cases. One should never adapt the condition to the operation, but always the operation to the condition. There is only one operation from which a permanent result can always be guaranteed; the vaginal pancolpohysterectomy, but this is very seldom indicated. The author has not averaged more than one such operation a year, during all the years that he has used it.

ANÆSTHESIA

The first general meeting of the scientific section was held on February 24, the subject under discussion being "Anæsthesia." The Chairman briefly reviewed the early history of anæsthesia and emphasized the importance and responsibility of the anæsthetist. DR. FRANK E. BUNTS, of Cleveland, Ohio, spoke on "The Nurse Anæsthetist," of which the following is a summary:

THE NURSE ANÆSTHETIST

One of the greatest advances in the administration of anæsthetics has been the advent of the nurse anæsthetist. The technical education of a physician is not necessary to acquire the ability to administer anæsthetics. The young graduate in medicine is

certainly not qualified to do it by reason of the teaching received while pursuing his medical course in college. The postanæsthetic troubles of the patient in the days when anæsthetics were administered by the interne are a matter of deepest regret to the surgeon accustomed to the almost eventless postanæsthetic state of the patient anæsthetized by the skilled, highly trained nurse anæsthetist. Her undivided attention to her work is in marked contrast to the almost unavoidable interest taken in the operative procedure by the medical graduate.

The responsibility for the patient must be assumed by the operating surgeon, whether the anæsthetist be a nurse or a physician. I am unwilling that the anæsthetist should decide for me whether or not the patient is a fit subject for anæsthesia. It is my responsibility, and I must assume it. I am at a loss to understand how one who has spent the time and money necessary to acquire the broad education of a physician, can willingly confine himself to the narrow specialty of administering anæsthetics, and in the final analysis, after all other special arguments have been advanced, I find its advocates resorting to the final and apparently, to them, conclusive argument—that it is depriving the physician of a legitimate and much prized source of revenue. We must not forget in this connection that it is the patient's safety and comfort that must receive first consideration, and not the doctor's pocketbook. At the hospital with which I am connected between five and six thousand operations are performed each year under general anæsthesia. With few exceptions, all anæsthetics are given by nurse anæsthetists, and in a number of years, I can not state offhand how many, there have been but two anæsthetic deaths, and both were cases where the anæsthetic was administered by a physician.

The World War demonstrated beyond any question the value of the nurse anæsthetist. Without her, our work in cantonment hospitals and in our service abroad would have been greatly hampered by the inability to secure properly trained anæsthetists among the medical officers in the army.

I wish it were possible for the great influence of this College of Surgeons, extending as it does into every part of America, to be definitely used not to forbid the physician to give anæsthetics, should he decide that that is what he is best qualified to do, but rather simply to assure the public and our state legislatures that we do approve of the nurse anæsthetist and that her abolition would be a calamity, not only to our largest and most active hospitals throughout America, but far more to the people themselves who may some time unfortunately have to pass through the ordeal of anæsthesia.

This paper was discussed by Dr. James Y. Welborn, of Evansville, Indiana, who believed that the anæsthetist should be a doctor and that nurses are fitted only for nursing. Nor did he think that an interne was qualified for this work; he insisted that the anæsthetic should be given only by a specialist devoting his entire time to this line of work.

Dr. Hugh H. Young, of Baltimore, Maryland, was of the opposite opinion and cited the work done at the Johns Hopkins Training School for Nurses, which devoted a specified period of time to the training of the nurse anæsthetist. He did not object to a doctor giving an anæsthetic when he was doing enough of this work to be qualified really to do it properly.

Dr. W. F. Grinstead, of Cairo, Illinois, said he employed nurses who are especially trained to administer anæsthetics, but he felt that the anæsthetist should be thoroughly familiar with the diagnosis and condition of the patient so that the anæsthetic may be given to the best advantage.

Dr. John F. Barnhill, of Indianapolis, favored the doctor as being better qualified for the administration of anæsthetics than the nurse, because of his broader training and experience.

GENERAL ANÆSTHESIA BY ETHER, CHLOROFORM, AND GAS

Dr. James Y. Welbokn, of Evansville, Indiana, gave an excellent discussion on "General Anæsthesia by Ether, Chloroform, and Gas," which, in part, was as follows:

There is nothing very new in the use of general anæsthesia. In the short time at my disposal, I can only tell you in substance of my experience, and the conclusion which I have arrived at after 25 years of work in a hospital of 72 beds.

While chloroform is a good anæsthetic, it is not the safest for us. It is probably used more generally throughout the country on account of its accessibility. Ether, considering all conditions, is in my opinion the most efficient and safest of all anæsthetics.

At our hospital where a physician devotes his entire time to giving anæsthetics and where about twelve hundred anæsthetics are given a year, I prefer gas. However, the conditions present usually indicate the kind of anæsthetic.

We find it most convenient to do our work in the following manner: One apparatus is used for gas-oxygen alone; another for gas-oxygen-ether; and the third for gas induction to be followed by ether. I do not know definitely, but McKesson claims that, regardless of the duration of operation, not over six or eight hospitals in the United States use gas alone for all operations. When gas alone is used there are four stages considered; the first and second stages are usually stages of uneven anæsthesia; the third stage is that in which most of our operations are done and consists of four strata; usually the operating is done in the first stratum, which is complete anæsthesia. In the second stratum there is apt to occur a spasm of the muscles, due to the use of too high a percentage of gas, and improved by the addition of oxygen. Herein lies the greatest danger in gas being administered by an inexperienced anæsthetist, who misconstrues this condition, taking it as too light anæsthesia and gives more gas, thereby causing death, when instead

it is too deep anæsthesia. The fourth stage is that in which death occurs.

Therefore, I say that a skilled anæsthetist is of the utmost importance.

In the general discussion, Dr. John Osborn Polak, of Brooklyn, said that he did not feel that gas anæsthesia was as safe as the author seemed to infer; but Dr. James T. Harrington, of Poughkeepsie, New York, thought that the conclusion that gas was unsafe might be due to the fact that many doctors are not qualified to give gas anæsthesia. Dr. E. R. Secord, of Brantford, Ontario, and Dr. Truman W. Brophy, of Chicago, advocated the use of chloroform in certain cases, favoring it especially in young children and in the presence of pulmonary irritation.

SPINAL AND CAUDAL ANÆSTHESIA

Dr. James T. Case of Battle Creek, Michigan, was asked to discuss "Spinal and Caudal Anæsthesia," and a summary of his remarks follows:

As to caudal anæsthesia I have not formed a very favorable opinion, for the reason that too large a quantity of novocaine must be injected to secure anæsthesia and too long a time elapses between the injection and the production of satisfactory anæsthesia. Nevertheless in occasional cases I employ this method, injecting 30 to 60 cubic centimeters of 1 per cent novocaine into the sacral canal, taking pains not to puncture the membranes and withdraw spinal fluid. If it happens that spinal fluid escapes through the needle, we virtually give an intraspinal anæsthesia.

Lumbar anæsthesia has been growing very rapidly in popularity during the last few years. In Germany and France it is very extensively used. In many clinics all major surgery of the lower abdomen and pelvis is carried out under lumbar anæsthesia. On this trip in South America we shall see a great deal of this type of anæsthetic. Professor Arce of Buenos Aires is not only one of the leading surgeons of South America, but one of the leading exponents of lumbar anæsthesia. (I prefer the term "lumbar" to "spinal" for the reason that many physicians and most laymen are frightened at any discussion of a *spinal* injection for diagnostic or anæsthetic purposes.)

The technique which I employ is that taught me by Professor Gosset, of Paris. The solution employed is solution C of scurocaine which I have procured from Paris through a house in New York. I shall be glad to furnish this address to any of you. Each ampule contains 3 cubic centimeters of 4 per cent novocaine in salt solution. Some of the preparations contain adrenalin and some do not. For the spine I think it is not necessary to use adrenalin. One needs a spinal puncture needle of the ordinary type with an ordinary hypodermic syringe of 10 cubic centimeter capacity which fits the spinal puncture needle. Other instruments at hand should be an ampule of caffeine, a sharp pointed scalpel, and a container for fluid to be used for examination for the spinal fluid Wassermann. The ampule of scurocaine is broken and its contents aspirated into the hypodermic syringe.

Two hours before the operation the patient receives a quarter-grain of morphine with one-five-hundredth of scopolamine. An hour later the patient receives a sixth grain of morphine with one-five-hundredth of scopolamine. Just as he is brought into the operating room, he receives an ampule of caffeine hypodermically. The patient's blood pressure should be taken just before the injection.

The patient is injected preferably in the erect position sitting on the side of the operating table or the side of the bed, the arms crossed, and the chin touching the chest. The back is arched slightly forward. The needle is introduced into the spinal canal between the third and fourth or between the fourth and fifth vertebræ—never higher. From 8 to 20 cubic centimeters of spinal fluid is withdrawn depending upon the level at which we wish anæsthesia and upon the amount of intraspinal pressure. If the fluid spurts out we withdraw more fluid. The higher the level to which anæsthesia is desired, the more the amount of fluid withdrawn. The necessary amount of fluid having been secured, the hypodermic syringe containing the 3 cubic centimeters of scurocaine 4 per cent solution is now fitted to the spinal needle and the plunger withdrawn until 6 or 7 cubic centimeters more of spinal fluid have been added to the scurocaine in the syringe. The contents of the syringe are then expressed into the spinal canal,—quickly and forcibly if a high level of anæsthesia is desired, slowly and gently if a low level of anæsthesia will suffice. The needle is withdrawn, a small dressing applied, and the patient placed in the horizontal position with extra pillows under the head to maintain sharp flexion of the neck, with the chin touching the chest.

In most cases the patient is at once ready for operation, the anæsthesia being immediate and complete below the umbilicus. If not, it becomes effective within a minute or two. Very seldom, indeed, is it necessary for the surgeon to wait; for by the time he changes his gloves and the patient can be draped the operation may be begun. If the patient is not anæsthetized in the pelvis and lower extremities, it suggests that the injection must have been extradural. It sometimes happens, especially early in one's experience, that the end of the needle does not lie frankly within the spinal canal, and in the slight manipulation of adjusting the needle the end slips outside the canal, so that the injection is not made into the spinal fluid. In such instances there are local areas of anæsthesia; but the purpose of the injection has not been achieved. It is my custom in such event to go ahead at once with the administration of a general anæsthetic. In our first hundred cases we had only three cases of failure of the anæsthetic, due, I believe, to this cause. In the next hundred cases only two failures, and now failure is very exceptional. If the anæsthesia has begun in the suprapubic region but does not reach high enough, the pillows are removed, the head extended, and the

patient placed for 30 to 60 seconds in the Trendelenburg position. The rapid extension of the anæsthetized area will be observed at once. The head is again flexed as soon as a sufficiently high level of anæsthesia is apparent. I cannot explain the value of head flexion; but it nevertheless is a point of technique to which I still carefully adhere.

Naturally the blood pressure will begin to drop as soon as the anæsthesia is achieved, just as a drop of blood pressure is noted in cases of sudden paralysis from any cause. There are undoubtedly alterations in the vascular tone of the anæsthetized parts which permit a definite drop of blood pressure; and this we must expect. As soon as a satisfactory grade of anæsthesia has been achieved I immediately start the hypodermic introduction of caffeine, and three or four ampules are given at intervals of 10 minutes during the operation if it lasts that long. As the operation proceeds a definite decrease in blood pressure will be noted, the systolic pressure dropping, for instance, from 130 or 140 before the injection to 90, 80, or even lower as the operation proceeds. I have seen a drop to even as low as 65 systolic. This does not alarm me for I have seen it repeatedly and have come to realize that it is a stage of the anæsthesia to be expected in certain cases of high injection, that its appearance is not alarming, and that it can be immediately raised if indication presents by the administration of nitrous oxide anæsthesia. At first I was much alarmed by the low blood pressures occurring fifteen or twenty minutes after the injections. Now I naturally watch these cases carefully; but I am not alarmed about them. I have never had a fatality attributable to the lumbar anæsthetic.

The relaxation secured by lumbar anæsthesia is highly satisfactory. "Abdominal silence" is realized to an unusual degree. Retractors are frequently unnecessary, because the abdominal muscles are so absolutely relaxed. The intestines are contracted as a result of the injection and for this reason one is not troubled with gas distention of the small intestine. In fact, it is important in the preparation of the patient not to use enemas within 3 or 4 hours of the time of the operation for fear the patient's bowels will move and thus soil the table. In gynecological work I always pack the vagina to avoid possible soiling by an unexpected bowel movement. This accident rarely happens if the precaution is taken to give no enemas within 3 or 4 hours of the operating time. If the Trendelenburg position is needed one need not fear to put the patient into an exaggerated inverted position. When the zone of anæsthesia has once been settled, it seems to spread no further even though the flexion of the head be neglected. I still continue, however, to keep the head sharply flexed, especially with the patient in the Trendelenburg position.

Even the slightest bleeding vessels should be tied off for fear of a postoperative bleeding when the blood pressure is restored. I have not had any accidents of this type, however.

The anæsthesia lasts from 45 to 90 minutes. Occasionally it will persist for an even longer time. Hence, most operations on the pelvis can be completed within the normal anæsthetic period by this method. If longer anæsthesia is required, there is no danger but rather a benefit in supplementing the lumbar anæsthesia by nitrous oxide general anæsthesia. As above intimated if the blood pressure should drop to an alarming point following injection I have occasionally employed gas and oxygen, because of its known tendency to increase the blood pressure. The blood pressure readings should be carefully taken by the anæsthetist and the surgeon informed of any serious changes. As soon as the blood pressure begins to rise any apprehension which may have been aroused may end.

One of the signs which should cause apprehension is vomiting. A tendency to nausea may in most cases be averted by pinching the patient's nostrils, thus forcing mouth respiration; the application of ice bags or cold compress over the neck; and by the avoidance of all unnecessary movement or talking. Absolute silence is maintained in the operating room except between the anæsthetist and the patient, and talking by the patient is not encouraged. It is our custom to place a large cold compress over the eyes and hanging down the sides of the head over the ears, still further to distract the patient's attention from the operating room sights and sounds. Those surgeons who are accustomed to place a colon tube in the rectum before operation for the purpose of injecting the colon with an enema during the operation, should realize that the anal sphincter is paralyzed and such introduction of tubes is not possible without danger of soiling the table.

The immediate danger is respiratory failure. I have not seen any suggestion of this in any of our patients, neither have I learned of such cases of respiratory failure in any clinic where the injections are made only below the third lumbar vertebra and where only novocaine is used. I never employ stovaine or any of the other substitutes for novocaine. In case respiratory failure should occur, however, Professor Gosset and his associates, especially Block and Desplas, have shown that the intradural injection of an ampule of caffeine in dogs will at once overcome the respiratory failure. I am told by Gosset that in any event, it is only necessary to carry on artificial respiration until the anæsthetic wears off, which means for 30 or 40 minutes at the longest. In case of a possible heart arrest, which I have not yet seen, I always have in readiness an ampule of adrenalin and a second spinal puncture needle, so that I am prepared for the injection of adrenalin into the heart muscle.

It is suggested by some that vomiting is a danger sign and indicates that the zone of anæsthesia is approaching the ventricles. I have, however, not seen any untoward results in any case. The literature tells of occasional fourth cranial nerve paralysis coming on several weeks after the lumbar injection and persisting for 6 or 8 weeks. None of our patients

has developed diplopia. I have always heard of headache as one of the contra-indications to lumbar anæsthesia. This occurs in about 4 per cent of our cases. We believe it is due to an insufficient withdrawal of spinal fluid before injecting the novocaine and we find that it is relieved by a further withdrawal of several cubic centimeters of spinal fluid. Headache is conspicuous by its absence among our patients.

Most of the cases call for food the first evening. In a series of eight hysterectomies, four done under lumbar and four under general anæsthesia, the convalescence of the four under lumbar averaged 3 days less than the four under general anæsthesia. It is our observation that the convalescence is much less likely to be complicated following the lumbar than after a general anæsthesia. Vomiting rarely occurs except in the operating room, and it should be prevented there.

We prefer this type of anæsthesia for all gynecological operations and other pelvic operations which require 20 minutes or longer and for all operations on the extremities which are of a major type. Prostatic and bladder surgery are nicely suited to this anæsthetic. Most satisfactory of all is the employment of lumbar anæsthesia in the repair of ventral hernia, for the extreme relaxation of the muscles makes very easy a satisfactory hernia operation. I only rarely deliberately undertake a gall-bladder or stomach operation under lumbar anæsthesia; but I never hesitate to operate for gall stones when, for instance, I find them accidentally during the course of a pelvic operation of not too great severity. The greater rapidity with which one can operate when complete "abdominal silence" has been achieved is one of the greatest advantages of lumbar anæsthesia, and one can go ahead with an additional cholecystectomy with this form of anæsthesia when he might not otherwise attempt it. I have done a number of posterior gastro-enterostomies under local anæsthesia by the ordinary infiltration method.

I do not employ this form of anæsthesia for short operations, feeling that while I have not encountered any mishaps, nevertheless the average sentiment against lumbar anæsthesia is so great that should I perchance have a mishap with a minor case I would be subject to grave criticism. So for all minor surgery on the pelvis or lower extremities I employ nitrous oxide-oxygen anæsthesia when it is not possible to employ local anæsthesia by the ordinary infiltration method. It has been my custom not to use lumbar anæsthesia with young people or with any one whose systolic blood pressure is lower than 100. Any previous history of meningitis or meningeal irritation of any kind (as lues) also constitutes a contra-indication.

I seldom *urge* a patient to take the lumbar anæsthesia in preference to a general anæsthesia. I frequently say nothing about the kind of anæsthetic until the patient is in the operating room. I then explain that the operation can be performed under local anæsthesia and the patient usually tells me to go ahead if I think it is best. I assure him that the anæsthetist with the gas-oxygen anæsthesia is ready at hand, and that if I fail to keep my promise not to hurt, the gas can be administered immediately. If the patient refuses the local anæsthesia I, of course, do not urge it unless there is some strong clinical indication against general anæsthesia. Should gas-oxygen be required in addition to puncture, much less gas will suffice. I believe the day will come when patients will wonder not why it is best for them to stay awake during an operation, but rather why they must go to sleep.

I should add that it is not necessary to use a fluid preparation of novocaine. One can prepare the dry novocaine powder or tablet. The amount of novocaine injected is from 0.10 to 0.12 gm., the average dose being about 0.10 gm. per each 15 pounds of body weight. The spinal fluid, after wasting the first few drops, is allowed to flow into a special tube containing the sterile novocaine. More fluid or less fluid is withdrawn according to the intraspinal fluid pressure as above noted and some of the fluid is laid aside for analysis. The solution thus made is aspirated into any kind of a syringe by means of a spare needle, the hypodermic syringe is then fitted to the spinal puncture needle, and further withdrawal of fluid made into the syringe until it is filled. The plunger is then discharged very slowly until about half of the syringe is empty and new fluid is aspirated and re-injected until by the end of four to six injections the syringe is emptied. The patient is then managed as above noted.

Dr. Samuel J. Mixter, of Boston, approved of spinal anæsthesia, especially in acute intestinal obstruction and in senile gangrene. He had also found it helpful in cases of postoperative distention. Dr. Case added that he had found hypodermic injections of pituitrin helpful in the last-mentioned condition.

LOCAL ANÆSTHESIA

The subject of "Local Anæsthesia" was then presented by Dr. Frederick B. Mowbray, of Hamilton, Ontario, as follows:

Local anæsthesia of the infiltration type is applicable in a wide range of procedures, including hernias of all types; abdominal sections where little or no dragging on the mesentery is anticipated; rectal and perineal surgery; as well as goiters; cranial, laryngeal, and tracheal work; and all operations of a superficial type.

Results cannot be attained without careful administration, having in mind always the anatomy of the parts. Then the correct anæsthetic must be used which, in most cases, is novocaine in strengths varying from $\frac{1}{5}$ to $\frac{1}{2}$ per cent. If adrenalin is combined with it, 3 minims of stock solution may be added to each ounce of novocaine solution.

When local anæsthesia is used, the surgeon must employ sharp dissection and avoid rough manipulation, because dragging sensations are not abolished even though painful ones are. Then, too, dragging

on the parts, especially in the abdomen, is sure to disturb nerves which have not been blocked. All abdominal viscera may be handled, provided the mesentery is not pulled upon.

In all operations one must block all the nerves reaching the operative field. This may be done by (1) injecting directly with the nerve at some distance from the field; (2) infiltrating all the tissues at least 1 to 2 inches from the field by a series of superimposed injections so arranged as completely to encircle the operative area. This may be accomplished by a subcutaneous, subfascial, intramuscular or extraperitoneal injection, as demanded by the individual case.

Always wait at least 15 to 20 minutes (by the clock) before commencing the operation. Be gentle in all manipulations!

RECTAL ANÆSTHESIA

As there was no general discussion, Dr. William Bryan, of West New Brighton, New York, was asked to present the subject of "Rectal Anæsthesia." His remarks follow:

When for any reason the inhalation method is contra-indicated as in operations on the face or throat, when inflammation is present, when there is undue sensitiveness of the bronchial mucous membrane, or there is fear on the part of the patient, resort may be had to rectal administration.

We use 75 per cent ether and 25 per cent olive oil. The patient is given a thorough cleansing enema in the afternoon and forenoon. One hour before beginning anæsthesia we give patient

Paraldehyde—℥ii per rectum
Morphine sulphate, gr. ¼ hypodermatically.

The room should be kept absolutely quiet and no talking allowed. Patient is placed on the left side with hips elevated.

The ether-oil solution should be in a glass container held about 12 to 15 inches above the body and should be allowed to flow by "gravity"—amount used being 2 ounces for each 20 pounds of body weight. From 5 to 10 minutes should be allowed for the giving of the entire amount. Usually ether can be detected on patient's breath in 11 minutes. Complete surgical anæsthesia should exist in from 15 to 18 minutes.

When the operation is completed the excess of ether-oil solution should be withdrawn from the rectum, and should be replaced by an equal quantity of olive oil.

If during the operation the patient's condition is not good, or if breathing should seem poor, a few inhalations of nitrous-oxide gas will be all that is necessary.

There are no contra-indications to this form of anæsthesia, except the presence of an ulcerative colitis or similar conditions about the rectum.

It is not an ideal procedure for use in children and is not advised; but if it is to be used it should be not stronger than ether 50 per cent and oil 50 per cent.

Dr. Harrington discussed "Rectal Anæsthesia" further, stating that he found this anæsthetic particularly satisfactory in operations about the head, extremities, and breast, but not so good in abdominal work. He used 75 per cent ether and 25 per cent olive oil, administering 1 ounce of the above mixture to every 20 pounds of body weight, obtaining anæsthesia in about 25 minutes. If anæsthesia is not complete, it may be induced by giving a few inhalations of ether. Should alarming symptoms appear, the colon should be promptly drained. Dr. Harrington mentioned one fatality in a very elderly patient, but was not sure that this was due to the anæsthetic.

Dr. Ross Miller, of Amherst, Nova Scotia, told of the use of oral anæsthesia in overseas service: 1½ ounces of ether was used to an ounce of liquid parolene for the average sized patient of, say, 150 pounds. One-third of a glass of port wine was given immediately before and after the administration of the mixture. He said there was very little post-operative discomfort, and the patient was often able to get up and leave the hospital as soon as he was awake.

CHOICE OF ANÆSTHETIC

The subject of anæsthesia was continued February 28. In opening the discussion Dr. F. N. G. Starr, of Toronto, Ontario, said that in his opinion the anæsthetic of choice for abdominal surgery is ether. He said that it is true that with a combination of gas, oxygen, and ether extensive operations may be done with a minimum of ether after relaxation is once obtained. In his experience gas-oxygen alone is rarely satisfactory for operations upon the upper abdomen because of the difficulty in obtaining complete relaxation. If this is not obtained it makes it difficult for the surgeon to employ the necessary gentleness that should obtain in the handling of intra-abdominal contents.

During the course of a year Dr. Starr operates upon a great many doctors and members of the families of doctors but he has never yet had a doctor request that the anæsthetist should be a nurse.

In the preparation of a patient for an anæsthetic his psychology must be studied and dealt with just as much and as carefully as any other part of the operation. It is important that patients should be fed and not starved.

Lumbar anæsthesia and local anæsthesia has a place and an important place in surgery. The author has not for years attempted a goiter operation with local anæsthesia and for this reason a former goiter patient said: "Do not do goiters under local." Upon asking "Why, had she been hurt?" she replied: "No, I did not feel any pain, but when you delivered that lump out of my neck, I felt as I have often imagined a turkey feels when it is being drawn—only from the opposite end."

In discussing the comparative merits of the trained physician anæsthetist as compared with the nurse anæsthetist, Dr. Starr said: "A man is a law

unto himself. Unfortunately some surgeons appear to think they should be a law unto the universe!"

During the early days of the war when the supply of doctors was limited, the British sent nurses to be trained in administering anæsthetics. Only about one in each 100 became proficient—that one became a marvel in proficiency but the scheme was later abandoned.

At Toronto in the General Hospital there is a chief anæsthetist and 8 or 10 assistants. Each student in his final year gives at least 6 anæsthetics under the supervision of a trained anæsthetist. While this does not make the student a specialist, upon graduation he understands the principles and if he desires to take up anæsthesia as a specialty, he has the ground work upon which to build his specialty just as any other student has for the other specialties.

Dr. Boldt's discussion follows:

I know nothing more valuable as a safety device in instances of patients in unfavorable condition for operation than the use of the tourniquet, particularly if we have reason to believe than there may be a large quantity of blood lost, or in operations that are likely to consume considerable time. To enhance the value of the appliance, in a few instances I have made use of bandages at the conclusion of the operation, to direct the blood from the extremities toward the trunk, and the improvement of the pulse is remarkable.

It is an error to assert that any one anæsthetic is perfectly safe. I have had the misfortune to have deaths from all anæsthetics, except methyl chloride, and that I have never used. But ether, chloroform, nitrous oxide gas, and lumbar analgesia have caused the death of patients in my hands.

In connection with lumbar analgesia, I would call attention to the desirability of using preliminary narcosis, starting 2½ hours before the beginning of an operation, giving a hypodermic injection of 1/180 grain of hydrochloride of scopolamine and $^1/_{12}$ grain of morphine; a second injection 1 hour later; and a third injection, if the patient is not very drowsy, at the lapse of the second hour. By the time the operation is begun, it will usually be found that the patient is in a more satisfactory condition for operation, and the lumbar puncture can more readily be made without apprehension on the part of the patient. It is desirable to blindfold the patient at the time of giving the first hypodermic injection, to put cotton into his ears, and also to avoid loud talking in the operating room. Where these details are observed, I have frequently had such patients sleep during the operation.

One should never insist upon the use of any particular form of anæsthetic. Although, as a rule, ether may be considered the safest in the majority of cases, upon the substitution of chloroform, if the patient is unsuitable for ether, the anæsthesia has progressed without the slightest hitch.

In long operations, as a radical operation for cancer of the cervix, I prefer to use lumbar anæsthesia.

Dr. J. Wesley Andrews, of Mankato, Minnesota, preferred gas-ether anæsthesia as a routine. Dr. Effie L. Lobdell, of Chicago, expressed the opinion that the preparation of the patient for the anæsthetic should be started as soon as the patient enters the hospital. The anæsthetist should gain the patient's confidence and avoid as far as possible all pre-anæsthetic shock. Dr. Lobdell also emphasized the importance of a careful general examination, and favored the administration of morphine and scopolamine before either local or general anæsthetic.

ANÆSTHESIA OF NOSE AND THROAT

Dr. Truman W. Brophy, of Chicago, presented the subject of "Anæsthesia of the Nose and Throat":

Before administering an anæsthetic the final consideration should be the preparation of the patient. A very large majority of my patients are infants. Many of these infants are poorly nourished, have been given improper food and are suffering from gastro-enteritis. Such patients, as we know, are not in condition to be given an anæsthetic. I put them under the care of a pediatrician who treats them until they are in satisfactory condition to take an anæsthetic and to be operated on. The diagnosis of the child's general condition is of the greatest importance. Enlarged thymus gland, status thymolymphaticus, acidosis, gastro-enteritis, rickets, etc., must be considered and treated.

Enlarged thymus may be recognized by percussion but more certainly by a good roentgenogram.

The enlarged gland may be reduced to normal size by treating with X-ray. One treatment is usually sufficient to reduce the enlargement to normal size, after which within a month or 6 weeks an anæsthetic may be given with usual safety.

We frequently find acidosis. As a routine we give sodium bicarbonate 4 or 5 days before we operate, X-ray the chest looking for enlarged thymus, eliminate gastro-enteritis, and note that the child is gaining weight before we operate.

In my opinion the position of the patient while taking the anæsthetic is of great importance. He should be in a recumbent position or even with the head lower than the body so as to get the benefit of gravity in carrying the blood to the nerve centers, thus abundantly supplying the nerve centers of the brain.

The anæsthetic which I use, almost to the exclusion of others, is ether. We know it is contraindicated in the presence of advanced nephritis and bronchitis, yet ether is the anæsthetic agent of choice in nearly all other maladies.

Extending over a period of about 20 years I used chloroform nearly always. Infants take it well. However, as I found so much opposition to it in the profession and as medical internes while in college had not been trained to administer it, and as anæsthetists are indisposed to give it, I concluded that I would not further insist upon its use. Therefore I now use ether almost exclusively. Nitrous-oxide-oxygen an-

æsthesia is very desirable in many operations. Tonsillectomies may be very successfully performed with its use, but it is not indicated in children and in prolonged mouth operations.

Within the last year a patient with whom I had previously had trouble following the administration of ether, returned for the last stage of a series of plastic operations. Previously I labored with him 16 hours to restore and maintain normal respiration after ether. I resolved to use morphine and scopolamine. I sent for an expert in its use and began with the first injection at 7 o'clock in the morning. He was taken to the operating room at 9:30. An operation occupying one and one-quarter hours was performed while the patient was completely anæsthetized. He was returned to his room, where after making rounds, I called about 2 hours after operating and found him talking to his nurse. Had I administered ether I doubt if he would have survived it.

CHOICE OF ANÆSTHETIC IN UROLOGY

DR. H. H. YOUNG presented the subject of "Choice of Anæsthetic in Urology."

The general rules as to the anæsthetic to be used are much the same as for other branches of surgery; but in urology the frequency of operations in aged men with prostatic diseases is so great that the age limit is very high. The kidneys are more frequently diseased, infections, stone, true nephritis, and back pressure impairment of function being commonly met with and adding to the gravity of anæsthesia. Cardiorenal disease is quite common in old men, and arteriosclerosis and high blood pressure, with cerebral symptoms, are often seen and cause grave concern where operation is imperative.

In a recent series of 1049 perineal prostatectomies, 370 patients were over 70 years of age and 31 over 80.[1] With very great age the mortality becomes progressively higher, being at 70 years 2.5 per cent, between 75 and 79 years, 5.3 per cent, and between 80 and 84 years, 7.1 per cent in my series of cases.

In the presence of diseased kidneys, ether is dangerous, and nitrous oxide or spinal anæsthesia is to be preferred. But in high blood pressure, marked arteriosclerosis and cerebral cases, nitrous oxide is dangerous on account of the increase in blood pressure produced. In some of these cases spinal anæsthesia, which lowers the blood pressure, would seem to be best to use, but it often causes so marked a lowering of the blood pressure as to predispose to cerebral thrombosis, so that ether, with its supportive action to the heart and only slight pressure-increasing effect, is preferable in these cases, as it is also in cases suffering from almost all kinds of cardiac disease.

In a consecutive series of 198[1] perineal prostatectomies without a death, there were 79 cases with the blood pressure over 150, 21 cases over 180, and 5 over 200, nearly all of the high blood pressure cases being done under ether anæsthesia. In this same series of 198 cases there were 34 in which the heart was enlarged, 30 with murmurs present, 16 both enlarged and with murmurs, and 16 with myocarditis, a total of 96 cases, or nearly 50 per cent.

Before determining the anæsthetic, careful functional studies of the kidneys should be made. For this purpose the phthalein test is much more helpful and accurate than ordinary urinalyses, as casts and albumin are often absent in severe renal disease.

Where the phthalein output in 2 hours is below 40 per cent, a blood-urea test should be done, and if over .50 grams per litre, most careful preparatory treatment should be given before operation, especially under a general anæsthetic. The phthalein test is so simple and so valuable that it should be employed as a routine in surgical cases. Blood chemistry is usually not necessary unless the phthalein is low.

The wonderful results which are obtained by catheterization in cases of back pressure due to enlarged prostate, are among the most gratifying things in surgery. Even severe uræmias, with almost no phthalein excretion, are ultimately restorable to fairly good function and operability by this means.

Diabetics are likewise to be brought into good condition for anæsthesia and operation by prolonged careful diatetics and insulin treatment. In tuberculous conditions of the urinary or seminal tracts, ether is to be feared on account of the frequent presence of pulmonary tuberculosis, active or arrested, which may be lit up by ether. In such cases I employ spinal or caudal anæsthesia or local injections of procaine in many cases.

But for general use I prefer nitrous-oxide-oxygen as an anæsthetic, adding ether only when necessary in prolonged operations, or to get more complete relaxation. Nitrous-oxide is especially good in the presence of chronic infections of the mouth or respiratory tract, when postanæsthetic pneumonias are to be feared. We make it a rule to wait until acute "colds" are recovered from, and occasionally to submit patients with badly infected tonsils or sinuses to operation or treatment for these diseases before undertaking urological operations under general anæsthesia.

To recapitulate, my opinion as to the choice of anæsthetic in urology, is this: ether, in the cardiac and cardiovascular cases; spinal, caudal or local procaine in the tuberculous or bad renal cases, bad nasopharyngeal and pulmonary infections; nitrous-oxide-oxygen (with as little ether as practicable) in the majority of cases, and especially the mild nephritics. By adequate functional tests, painstaking preparatory treatment and careful choice of anæsthetic, patients who were formerly considered grave risks may now be safely carried through even severe urological operations.

ANÆSTHETIC OF CHOICE IN ORTHOPEDIC SURGERY

DR. R. D. KENNEDY, of Globe, Arizona, in discussing "Anæsthetic of Choice in Orthopedic Surgery," said:

[1] Surg., Gynec. & Obst., 1923, xxxvi, 589.

Local anæsthesia is of great service in tendon reconstruction of the forearm. This is particularly true when the anatomy has been distorted by scar tissue or otherwise, inasmuch as the patient can be of great help in enabling the surgeon to identify the anatomy, thus lessening the necessity of extensor dissection in order to recognize the different structures.

ANÆSTHESIA IN GENERAL SURGERY

Dr. T. Casey Witherspoon, of Butte, Montana, speaking of "Anæsthetic of Choice in General Surgery," said that an examination by a competent internist is of value when there is any question at all about the kind of anæsthetic to be administered. While he personally prefers ether in general and procaine in local anæsthesia, he urged every man to become thoroughly familiar with one local and one general anæsthetic, so that he would have an instinctive knowledge of the condition of the patient as he was operating. He could see no reason for using a solution of procaine stronger than 1/4 of 1 per cent.

On opening the scientific section March 1, 1923, the chairman, Dr. Schaeffer, announced a continuation of the general discussion of anæsthetics. In discussing the relative merits of the nurse and doctor anæsthetist, Dr. Secord and Dr. Starr were very positive in their preference for the physician anæsthetist. Dr. Secord intimated that the principal reason for employing a nurse anæsthetist was due to a desire to save money, and Dr. Starr felt that if internes were given the training they *should* have, the anæsthetics would be much safer than those given by the nurse. Dr. W. J. Brooke, of Bayonne, New Jersey, said that the question is largely one of local custom and convenience, but he felt that where a physician who specializes in anæsthetics is available, he is generally superior either to the nurse or to the recently graduated interne. Dr. L. H. Taylor, of Wilkes-Barre, Pennsylvania, Dr. C. D. Schaeffer, and Dr. R. D. Kennedy were strongly in favor of the properly trained nurse anæsthetist. Dr. Schaeffer said that the nurse anæsthetist should bear the same relation to the surgeon that the technician does to the X-ray or laboratory specialist; that the anæsthetist should be thoroughly acquainted with the patient before starting the anæsthetic and that he should not be relieved of the responsibility until the patient has entirely recovered from the anæsthetic. Dr. Kennedy mentioned the fact that in sparsely settled districts it might be quite impossible to secure a physician anæsthetist and warned against any legislation which would make it illegal for a nurse to give an anæsthetic, as the delay resulting from the difficulty in securing a physician anæsthetist might easily prove fatal to the patient. Dr. Bunts' plea that the nurse be allowed to give a general anæsthetic when advisable was warmly applauded by the majority of the Fellows present.

Dr. John Osborn Polak, of Brooklyn, was asked for his opinion of sacral anæsthesia. He stated that he had only used it a few times in cases of cæsarean section, but was pleased with the lack of any evidence of anæsthesia in the newborn child so often present when ether is used. He has used sacral anæsthesia in all types of pelvic operations, but prefers ether in most cases. He injects about 40 cubic centimeters of 1 per cent novocaine with adrenalin through the foramina into the pericaudal tissues, which produces complete anæsthesia in from 10 to 20 minutes, although at times he finds it necessary to supplement it with gas.

Dr. Boldt stated that he had made a careful study of sacral anæsthesia as used in the various hospitals and found it on the whole to be rather unsatisfactory due to frequent failures and the large amount of solution required.

Dr. A. J. Crowell, of Charlotte, North Carolina, has used sacral anæsthesia exclusively during the last 3 years, in perineal prostatectomies. In 15 to 20 per cent of his cases, he supplements it with gas and in some cases, while peeling the gland from the capsule, he finds it necessary to inject 2 per cent novocaine to block off the sacral plexus. The anæsthesia lasts from 3 to 8 hours, his patients having practically no postoperative shock.

Dr. John F. Barnhill took exception to the large amount of novocaine injected and mentioned a patient who had died suddenly following the injection of 1½ grains of novocaine in 3 cubic centimeters of solution, but qualified this with the remark that death may have been the result of extreme fright rather than from the anæsthetic.

Dr. H. H. Young emphasized the importance of a careful study of local anæsthesia and urged a systematic consideration of the subject by a committee of the American College of Surgeons. He strongly emphasized the danger of operating on frightened patients and mentioned case reports of three or four patients who had died undoubtedly of fright while awaiting their turn to be anæsthetized.

Dr. T. Casey Witherspoon then presented the following: "Resolved that we express ourselves as opposed to any and all legislative enactments which would prohibit the nurse, when qualified, from giving anæsthetics." This was seconded by Dr. Young, discussed by Dr. Brophy and Dr. Grinstead, and passed without a dissenting vote.

Dr. Truman W. Brophy expressed the opinion that while gas might be all right for a short operation, for long-continued work ether is preferable. He stated that surgical shock is much less frequent in children before the age of 3 months than afterward, due to incomplete development of the nervous system.

Dr. James T. Case, of Battle Creek, Michigan, did not think that lumbar anæsthesia produced shock; that 10 cubic centimeters of solution was all that was necessary; and that a fall in blood pressure should not be cause for alarm, for if the blood pressure does fall it can be quickly increased by giving a small amount of laughing gas. In his experience, anæsthesia is practically instantaneous, and

he has found it possible to do intra-abdominal work within 4 minutes of the time of beginning the injection.

Dr. Young asked if the sudden reduction in blood pressure might not increase the danger of emboli in elderly patients. Dr. Case replied that he did not think there was as much danger from this as from the increasingly high blood pressure produced by the use of ether. Dr. John George MacDougall asked if the patient could be placed in the inverted position. Dr. Case answered that so long as the neck was flexed on the chest, the patient's head could be as low as necessary.

THE ACCESSORY AIR SPACES OF THE SKULL

Dr. John F. Barnhill presented a lantern demonstration of the accessory air spaces of the skull. He stated as a preliminary that the main objectives intended would be:

1. To demonstrate the mode of development of these sinuses between the tables of the skull, the full importance of which he believed was not as yet fully appreciated, especially from the surgical standpoint;

2. To demonstrate the influence of the development of these several sinuses on the normal development of the mouth, teeth and face, and especially to prove that obstruction to normal respiration in the infant and child from any cause furnishes the chief reason for malformation of the mouth, irregular teeth, narrow face, and deflected nasal septum;

3. To show the intimate and very extensive surgical relationship of the several sinuses to the dura mater and its contents, and through its relationship, to the cause of meningitis, brain abscess, and sinus thrombosis;

4. To point out the pathways from these air spaces to the general system, through which infection may travel and from which source many local and general diseases undoubtedly arise.

In discussing Dr. Barnhill's address, Dr. Emil G. Beck, of Chicago, referred especially to the possibility of intrathoracic lymph-gland infection from sinuses, tonsils, etc. He had taken stereoroentgenograms of the chests of fifteen apparently healthy nurses and found all to have enlarged intrathoracic lymph nodes.

Dr. W. E. Waddell, of Los Angeles, California, emphasized the fact that a healthy head almost invariably pre-supposes normal intranasal structures and quoted cases of prompt improvement of vision following restoration of ethmoid drainage.

Dr. Frank M. Sulzman, of Troy, New York, made a plea for more exact diagnosis, emphasizing the value of the X-ray and the doubtful value of transillumination. The diagnostic value of position was referred to by Dr. Randolph Winslow, Baltimore, Maryland, while Dr. Brophy called attention to Dr. Schaeffer's investigation which showed that 56 per cent of frontal sinuses empty into the antrum instead of the infundibulum. He made a plea for the conservation of the teeth in the presence of antrum infection, limiting removal to those which are definitely infected.

FRACTURES

On March 6, the subject of "Fractures" was discussed and Dr. E. R. Secord, of Brantford, Ontario, presented his views.

The treatment of fractures is an important subject, not given the attention which it deserves, either in undergraduate or postgraduate studies.

Over 60 per cent of suits for malpractice, and almost 100 per cent of the adverse decisions are based on fracture cases.

Many improvements in methods of treatment have gradually been evolved with which the names of Bardenheuer, Lucas Championere, Lane, Robert Jones, Codivilla, Steinmann, Besley, Pearson, Albee, and Gallie may be associated.

Various methods of treatment of any given fracture may be successfully used by different individuals depending on their experience, environment, available assistance, and apparatus. The results achieved by Pearson and Drummond by direct extension in fractured femurs during the latter years of the war bear evidence to this.

In a general way, most fractures may be successfully treated by combined reduction and retention and indirect fixation, provided sufficient attention and care, including proper roentgenological examination, is given. Certain types of fracture, however, are at times best treated by operative means with some form of internal fixation. It would appear that fractures of both bones of the forearm, at or about the middle, and fractures of the upper third of the femur most frequently are examples of this necessity.

In such types in recent simple fracture the Lane plate is probably the method of choice, and it is unlikely that the proper use of the plate will be followed by the dire consequences that are feared by the advocates of the autogenous bone graft. Following operation, however, any form of internal fixation must be treated with the same support and immobilization which would have been used had operation not been done.

In ununited fractures, autogenous bone grafting is the treatment of choice; but for some unknown reason, possibly because of the chemistry of the body fluids and of bone formation, bone grafting fails because of the absorption of the graft in about 20 per cent of the cases, even under the most favorable circumstances.

Dr. R. D. Kennedy, of Globe, Arizona, emphasized the importance of exact knowledge of the surrounding soft parts in the management of fractures. He was of the opinion that regardless of the care which is exercised in the treatment of fractures, deformities will sometimes occur. Dr. J. T. Harrington, of Poughkeepsie, New York, in treating fractures of the patella, uses ordinary suture material, having used wire in only one case of secondary fracture.

The question of damage suits as the result of fractures was discussed informally. Dr. Secord stated that 76 out of 124 damage suits were fracture cases, and that the only suits lost by the defendant were fracture cases.

TENDON TRANSPLANTATION IN THE FOREARM

Dr. R. D. Kennedy, of Globe, Arizona made the following remarks on "Tendon Transplantation in the Forearm":

Tendon transplantation is done in the forearm following irreparable injuries to the musculospiral or posterior interosseus nerves, or such extensive destruction of the muscle tissue of the extensor muscles as to render them functionless. If the injury to the musculospiral is above the point where the nerve supply is given off to the extensors of the wrist, it is necessary to transplant the pronator radii teres into the extensors of the wrist. This is done by making an incision about the middle of the radius on the anterior surface, displacing the supinator outward and the nerve and vessels inward and exposing the pronator at its insertion. The tendon is short and flat and it is better to remove it with the periosteum attached. The wrist is dorsiflexed and the extensor tendons exposed. They are pulled up enough to maintain dorsiflexion, and with a sharp scalpel a slit is made in both of them through which is passed the tendon of the pronator. One-half of the extensor tendons is sutured to the pronator using chromic catgut. The sheath is carefully restored to prevent adhesions, and the skin is closed while the assistant maintains the dorsiflexion so as not to put too much strain on the point of transplant. An incision is now made in the skin beginning a little below the middle of the radius passing down well beyond the styloid process across the dorsum of the hand and up along the outer side of the ulna to a point about halfway between the wrist and elbow. The skin flap is carefully dissected back and the tendons exposed. The flexor carpi radialis is separated from the attachment and drawn upward through a small incision over the lower end of the belly of the muscle. From this point a probe is forced through the tissue and the tendon drawn down through the opening made in a straight line to the three extensors of the thumb, where, with the thumb extended, it is transplanted in such a position as to maintain the extension. This transplant is done as already described. Now the extensor carpi ulnaris is divided from its insertion, care being taken not to injure the vessel or nerve which lie quite close to it. It is dissected upward for about 5 inches and brought across the dorsum of the hand in a straight line to the common extensors of the fingers into which it is transplanted, as already described.

The skin incision is placed well down on the hand so that the line of tendon suture and skin suture will not superimpose and increase the number of adhesions.

The skin is closed and the hand put up on a cock-up splint which will also maintain the extension of the thumb. At the end of 10 days some passive motion is used. At the end of 3 weeks some active motion. At the end of 5 weeks the splint is discarded except at night, and in 2 months the patient should be freely using the hand.

In discussing Dr. Kennedy's paper, Dr. F. N. G. Starr emphasized the importance of keeping the hand in the position of extreme extension.

Dr. Kennedy in closing the discussion stressed particularly the use of the so-called cock-up splint in his operative cases, the importance of accurate diagnosis, and mentioned the difficulty so frequently encountered in suturing the interosseous nerve.

REMOVAL OF URETERAL STONE BY CYSTOSCOPIC MANIPULATION; DISINTEGRATION OF CYSTIN STONE BY PELVIC LAVAGE AND INTERNAL MEDICATION

Dr. A. J. Crowell, of Charlotte, North Carolina, presented a paper dealing with "The Removal of Ureteral Stone by Cystoscopic Manipulation and the Disintegration of Nephritic Cystin Stone by Pelvic Lavage and Internal Medication," as follows:

I wish to illustrate to you this evening by means of slides, first, a method of removing ureteral stone by cystoscopic manipulation, a method which has been very satisfactory in our experience; and, second, to report briefly the method of disintegrating cystin stone in the kidney by pelvic lavage and internal medication.

The method by which we have succeeded in removing stone from the ureter in about 140 consecutive cases with seven failures, since February, 1915, consists of ureteral anæsthesia and ureteral dilatation. We inject a solution of novocaine, 2 to 5 per cent, into the lumen of the ureter through a ureteral catheter and dilate the ureter by means of the retention catheter and metallic dilator.

The success of the method is largely dependent upon the extent of bladder and ureteral anæsthesia. To obtain this, 1 or 2 ounces of the above mentioned solution is injected into the bladder through the urethra and retained for 10 to 15 minutes before filling the bladder with boric acid solution. (If the patient is very nervous or unduly sensitive, it is probably better to use sacral anæsthesia.) The ureteral catheter is then inserted into the ureter until it meets with resistance. At this time procaine solution is slowly injected through the catheter and allowed to remain for 10 minutes. The catheter can then be passed above the stone without difficulty in most instances and especially is this true if oil is injected during this manipulation. With this technique, we have failed to get by the stone in only three instances, but frequently several attempts have been necessary to succeed.

When the catheter has passed the stone, we are masters of the situation. It can be fastened in and retained almost indefinitely. The presence of the catheter will allow the secretion of the kidney to pass through it as well as to dilate the ureter. In this way

functional activity can be ascertained and decision made as to whether or not the kidney should be removed. If infection be present, or should it occur during the course of treatment, the kidney pelvis can be lavaged with antiseptic or saline solutions.

The rapidity with which the size of the catheter can be increased and the length of time it may be retained depends upon the reaction produced by its presence and the size of the stone. Usually a No. 9 tapered catheter will pass the stone after a No. 6 has been retained for 24 hours. We think it well to remove the catheter after it has been retained for 48 hours. In this way we give time for the reaction produced by the presence of the catheter to subside and to see if the stone will pass without further dilatation. If the ureter is thoroughly anæsthetized before withdrawing the catheter and the kidney pelvis is filled with hot saline solution and sterile oil, the small or medium sized stone will pass into the bladder in a very short time, certainly if it is one of recent impaction. Should this fail, the dilatation may be continued until two No. 11's and one No. 6 in the male, and three No. 11's in the female are used. This dilatation may be augmented by means of the metallic dilator. The instrument used is of special value in assisting the stone to pass through the bladder wall and out of the ureteral opening.

The simplicity and safety of this method is very evident. It is simple in that any one reasonably skilled in cystoscopy can do the work in his office or hospital with perfect safety, without using a general anæsthetic and without marked suffering on the part of the patient. It is safe because no trauma of consequence is produced, and in addition to the function of the kidney not being inhibited, drainage frequently improves the renal function. In fact, we have seen marked uræmic symptoms clear up rapidly following such drainage.

Fatalities following this work are unnecessary if ordinary precautions are observed in the technique. This cannot be said of the surgical procedures necessary for the removal of the ureteral stone. The fatalities following operation for the relief of ureteral stone range from ½ of 1 per cent to 20 per cent. From 40 to 60 per cent of the cases applying for relief of this condition have been operated upon with no record of an effort having been made to remove them by cystoscopic means prior to our report of this work in 1921. Some claim that 90 to 95 per cent of these stones will pass spontaneously. If this be true, it is evident that we have been operating upon far too many cases for the relief of this condition.

We do not use this method in children where the urethra is too small to admit a catheterizing cystoscope or in men with enlarged prostates or other conditions, such as bladder tumor, stone, etc., making ureteral catheterization impractical. Of course, it is not applicable in cases of anuria or where the kidney's function has been destroyed by infection.

I will now discuss our method of disintegrating cystin stones in the kidney under pelvic lavage with alkaline solutions, thus rendering and keeping the urine strongly alkaline. We used in our case for pelvic lavage a 1 per cent solution of mercurochrome and gave bicarbonate of soda to alkalinize the urine. Just what part the mercurochrome played, other than to get rid of the virulent infection, I cannot say, but we do know that the solution is alkaline and very penetrating.

Cystin nephrolithiasis is a rare but a very interesting condition. It is interesting, first, because of the uncertainty of its etiology; second, because of the probable infrequent recognition of the disease; and, third, because of the excellent results which may be obtained by proper diet, pelvic lavage, and internal medication. The disease has been known for more than one hundred years. Link was able, in 1912, to collect from the literature only 146 cases. To our knowledge, we have had only one case at our clinic. We probably have had others but did not recognize the condition.

A great many theories have been presented, and considerable laboratory work done in connection with clinical observations in order to arrive at a satisfactory explanation of cystinuria, but thus far we are still far from it.

All agree, however, that since cystin is soluble in alkaline solutions, a very important part of the treatment is to render the urine alkaline and keep it so. The lower the protein intake, the easier this will be to accomplish. We took advantage of this knowledge and used it with great success in our case.

Dr. H. H. Young, of Baltimore, Maryland, congratulated Dr. Crowell on his success in removing calculi through dilated ureters and mentioned that some 250 years ago chemical methods were employed in attempting to dissolve ureteral and renal stones. Waters from certain mineral springs seemed to be beneficial at times. Stones may be fractured by changing the chemical reaction of the urine. As stones frequently occur after an operation, he felt that the question of prevention was of great importance, and thought very favorably of disintegration for this reason. He mentioned that while novocaine aids dilation of the ureters, morphine has a tendency to contract the ureteral muscle fibers. He also stated that fulguration was sometimes very helpful in delivering stones from the visceral end of the ureter.

Dr. J. W. Riley, of Oklahoma City, Oklahoma, thought that sterile water, oils, etc., were about as useful as chemical agents as most stones are discharged spontaneously, and Dr. G. A. B. Addy, St. John, New Brunswick, said that he treated all cases surgically, as he thought that instrumentation was more harmful. He spoke of plugging the visceral orifice of the ureter with "sea tangle," dilating the ureter by back pressure.

Dr. Crowell, in closing, stated he used 1 per cent mercurochrome in the pelvis of the kidney with normal salt solution. All solutions must be warm.

Replying to an inquiry from Dr. Polak he stated that the catheter may be left in the ureter as long as necessary, 36 to 48 hours, if the kidney is kept clean. He has had no bad results from instrumentation and thinks that 95 per cent of the stones can be passed without operative procedure. This being the case, the patient should not be subjected to the danger of an operation.

THE PATHOLOGICAL BLADDER AND POSTERIOR URETHRA

On March 26, Dr. J. U. Reeves, of Mobile, Alabama, presented a very interesting lecture on "The Pathological Bladder and Posterior Urethra—A Cysto-Urethroscopic Study." The lecture was given for the purpose of illustrating this procedure to the man who is doing the work as a matter of routine, and to show just what the cystoscopist is doing or trying to do with genito-urinary conditions. He first exhibited a sagittal section showing the cystoscope in place within the bladder and then within the posterior urethra, followed by numerous color plates showing the normal bladder and urethra; the various bladder tumors with the method of fulguration; vesical calculi, single, multiple and intradiverticular; stones within the ureteral orifice, and those within the ureter causing a bulging within the bladder; conditions of the posterior urethra; papilloma; old protastatic abscesses; the ejaculatory ducts; and pathological conditions of the colliculus. There was no discussion.

OBESITY—CAUSES AND TREATMENT

On March 27, Dr. C. Lee Graber, of Cleveland, Ohio, discussed the subject of "Obesity, Its Cause and Rational Treatment":

Obesity, for the purpose of this discussion, is defined as an increased deposit of general bodily fat in such amount as to interfere with proper function. It is a subject much neglected by physicians and surgeons alike in spite of the fact that it is of great importance in many instances. Its cause has been erroneously attributed to overeating and underexercise. As evidence that these supposed causes are not the etiological factors in the majority of cases, the following is submitted.

1. Fat people, as a rule, eat less than others. This is a matter of common observation.

2. The obese, because of being compelled continuously to carry about their exceedingly burdensome weight of superabundant fat are already working their hearts and skeletal muscles far in excess of normal exercise.

3. Carefully taken histories of these cases show in the great majority of instances, that the taking on of increased weight began with some crisis or other special incident: an attack of typhoid, sudden cessation of menstruation; an operation, not necessarily on the genitals; the birth of a child; marriage; the onset of puberty; the menopause, etc.

The foregoing should cause one to seek further for the etiology. The most plausible cause suggested is that of endocrine dysfunction. As yet no one has demonstrated satisfactorily what endocrines, or combinations of them, if any, are at fault.

Empirical practice, however, has demonstrated without a doubt the efficiency of treatment directed along this line. In the writer's experience, covering a great many cases over a period of 18 or 20 years, the intelligent administration of desiccated thyroid has proved remarkably efficient in the great majority of cases. Occasionally, in women, it has been combined with ovarian substance.

The physician should always dispense it himself, using without change the uniform product of a reliable firm. The dose is from ¼ to 6 grains of the U. S. P. product three times a day. He should weigh his patient every 5 to 7 days until the dose in the given case has been established, aiming to secure an average gradual diminution in weight of ½ pound a week. Overdosage is indicated by symptoms of hyperthyroidism. This all subsides in a few days on discontinuing the medication. Underdosage produces no loss in weight. No special attention need be paid to exercise or diet. Hypertension, cardiac and renal disease are not contra-indications to treatment.

Dr. Polak, in opening the discussion, said that he felt that as obesity has a harmful influence on the progress of operative cases, it should be reduced if possible.

Dr. F. E. Bunts thought that obese persons were more liable to gall stones and that obesity was largely hereditary and possibly due to endocrine unbalance. He recommended a book entitled "Eat and Grow Thin" as presenting rational suggestions on this subject.

Dr. J. T. Case, of Battle Creek, Michigan, said he thought that the consideration of calories was of considerable importance. He favors exercise, swimming in cold water, electric sweat baths, etc., but questions the value of thyroid therapy as mentioned by the essayist.

Dr. J. R. Espy, of Trinidad, Colorado, said he thought that the cause of obesity was more or less coincidental and attributed fatness to heredity and exceptionally good epicurean tastes. He agreed with the essayist that while thyroid is helpful in some cases, it is by no means specific, and that very systematic exercise helps some.

Dr. Effie L. Lobdell, of Chicago, thought that oxidation of tissues was the keynote of the control of obesity. She favored diet and the control of calories, with pleasurable exercise. She referred to the dinner pills so popular in days gone by, which were supposed to interfere with digestion of food, and she urged those who are not doing heavy work to eat sparingly.

Dr. Graber, in closing, stated that while he did not claim an endocrine course as specific, he thought that at least it does more than any other one thing. If the patient does not improve on thyroid alone, ovarian extract is added. He was not very optimistic as to the result of diet, and stated in answer to

questions that the treatment should be kept up as long as the patient lives or obesity continues.

MORTALITY IN CÆSAREAN SECTION

On April 2, DR. J. O. POLAK, of Brooklyn, New York, presented the subject of "Why the Mortality Following Cæsarean Section is Higher than that Following Other Elective Abdominal Procedures."

Incidence of cæsarean section: Hopkins, 1 in 110 labors, 20,000 cases; Long Island, 1 in 120 labors, 5,000 cases.

Potter of Buffalo: 1 in 14, 1921 series; 1 in 11, 1922 series.

While cæsarean section is the easiest way to deliver the baby and, everything favorable, the surest way to secure a live baby, it is not free from danger to the mother. All obstetricians know it is used too freely. If this is true, then what are the accepted indications? Roughly we divide them into—

A. Absolute: in pelves below 7 centimeters, where other means are impractical, and in cancer of the cervix.

B. Relative: misfits—after a test of labor. Here the fault may be in the pelvis, the child, or the soft parts.

Border-line conditions should always be given a test of labor, except in old primiparæ, as 81 per cent come through spontaneously but this test should be properly conducted. The mechanism of labor never begins in misfits until the cervix is fully dilated. Hence the patient should be given at least an hour's hard pain in the second stage, aided by posture, and a light abdominal binder. But you say if we do this how can we conserve the woman's strength and protect her from infection. (1) By rest with morphine and scopolamine; (2) by nourishment; (3) by conservation of the membranes; and (4) by avoidance of vaginal examination.

Other relative indications are: certain cases of central placenta prævia, which are clean and without severe blood loss; eclampsia but more particularly in the pre-eclamptic stage; endocarditis, where a break has occurred during pregnancy and compensation has been re-established; undilated soft parts after extensive plastic operations; prolapse of cord at term in old primiparæ with membranes ruptured and cervix unprepared; dystocia from previous retroversion operations; some complicating tumors incarcerated in the pelvis, as ovarian cysts and occasionally for obstruction from fibroid in the lower segment; accidental separation or abruptio placentæ when the hæmorrhage cannot be controlled by conservative measure; and rupture of the uterus.

Cæsareans may be divided into the clean suspect and frankly infected cases. Time during which patient has been in labor influences result. Never let a uterus tire for it predisposes to atony.

Selection of operation; classical, transperitoneal, cœliohysterectomy.

Cause of infection: bacteria are always present after 5 days.

Technique. A low incision is used because fundal scars are dangerous.

The uterus is not eventrated and the incision is limited by two guy sutures placed in uterine wall about 6 inches apart.

Hæmorrhage is controlled and retraction secured by means of ergot and intra-uterine pack. The wound is sutured and peritonealization is done.

Conclusion: Section is more dangerous than other clean, elective abdominal procedures—because prenatal work is not routine, interpartum care casual, and there are pathogenic bacteria present in every uterus before the end of the first week.

The discussion was opened by DR. H. J. BOLDT, of New York, who advised against the abuse of cæsarean section and mentioned the case of a child which was born naturally after all preparation had been made for cæsarean section but before the operation could be performed. He strongly urged that cases with severe cardiac conditions requiring cæsarean section should have a sterilization operation at the same time. He did not feel that pelvic tumors were necessarily a sufficient cause for cæsarean section, as they are frequently pulled up out of the pelvis before the beginning of labor.

DR. J. W. ANDREWS, of Mankato, Wisconsin, congratulated the essayist on his conservative attitude with reference to cæsarean section and with Dr. J. L. Stevens, of Mansfield, Ohio, asked further information about intra-uterine packing.

DR. JUAN POU ORFILA, Montevideo, Uruguay, S. A., was asked by the chairman to present the attitude of the South American surgeons with reference to the subject. Dr. Pou Orfila, congratulated the essayist on his paper and said that he felt that cæsarean section was not technically difficult and that its principal danger lay in the fact that the condition of the patient was poor, because of the physiological relation of the entire organism to the uterus and its functions. He emphasized two things: first, the probability of existing latent local infection in the cervix, and, second, the enormous hypertrophy not only of the myometrium but of the arteries, veins, and lymphatic vessels, all of which magnified the surface exposed for absorption and prepared for the increased danger of infection and hæmorrhage. He also emphasized the lower resistance of the patient, and the possibility of renal and hepatic insufficiency. General metabolism is frequently disturbed near the end of gestation, which may be due to placental toxæmia. In closing, he said he felt that the prognosis in cæsarean section depended on the association of two principal groups of pathological factors: genital and general, and he outlined his conclusions as follows:

First, as to indications, we must attempt to limit the practice of cæsarean section to those cases which, for instance, show pelvicocephalic disproportion greater than 2 centimeters; if the disproportion is less we should do instead the subcutaneous symphysiotomy of Frank, which is so simple and gives such good results.

Second, from the local point of view, we must give careful attention (a) to the vigorous preparation of the genital canal, both by asepsis and antisepsis, (irrigations of lactic acid 5:1000 solution); and (b) to the systematic employment before operation of hypodermic injections of pituitrin and sometimes of adrenalin. We have also frequently used with good results in our clinic as a substitute for ergotin, the new preparation of Bayer, tenosin, which has the advantage of being more rapid.

Third, from the general point of view, we must give attention to the pre-operative preparation and postoperative care of the patient, employing dietetic measures, elimination measures; neurotherapy and psychotherapy; endocrinotherapy, single and pluriglandular; and such other therapeutic and hygienic methods as may seem indicated.

Fourth, from the technical point of view, we are convinced of the advantages of the low incision, the only one we use, and we employ either the intraperitoneal or extraperitoneal, depending on the case.

Questions by Drs. Henderson, Stevens, and Kickland were answered by Dr. Polak in closing. In the case of an abdominal gunshot wound requiring abdominal section, he would advise not disturbing the pregnancy. He feels that section should not be resorted to in primipara even of advanced years without a preliminary attempt at labor, and in any case, the circumstances should be explained carefully to responsible relatives. He re-emphasized the value of the low incision, as it might not be necessary to do a second section. In packing, he uses gauze in the uterus but not in the cervix. In this way, the uterus contracts and helps to occlude the placental site; bladder peritoneum is used to cover the wound, as is done in hysterectomy.

INGUINAL HERNIA

On April 4 Dr. George Earl, of St. Paul, Minnesota, presented an illustrated lecture on "Inguinal Hernia."

Inguinal hernia is infrequent in animals on all fours. Occasionally it occurs in the pig, ram, and stallion, and then during copulation when the animal tends toward an upright position. It is significant that the human first creeps on all fours when the inguinal canal is oblique or horizontal. With the erect position the canal becomes vertical or nearly so, visceroptosis follows, and the mesentery is no longer able to hold the bowel and omentum away from the open ring. Strain of the diaphragm is a factor. Birds do not have a diaphragm and hence with them sudden or heavy internal force has greater room for distribution.

In making the incision and in suturing one should avoid the ileo-inguinal and ileo-hypogastric nerves, or sensory disturbances will follow. Injury usually comes at the time of incising the external oblique. The fascia should be freed and elevated, and the incision begun away from the external ring, working toward that structure.

The region of the internal ring is relatively of less importance. If the sac is properly dissected from the cord, there is usually no difficulty. If there is a recurrence, it is usually small and gives no symptoms. Torek's technique in working about the internal ring is a contribution of value. Where the cord from below and the vessels from above meet, the protrusion of the sac marks an indirect hernia, the sac then turning to an anterior position as it extends downward. After separating the vessels from the cord and both from the sac, I have the habit of opening the sac. From this point of vantage one can determine the extent of the sac downward, examine for the presence of a complicating direct hernia, and palpate the position of the bladder. In the direct type the bladder not infrequently herniates widely and exact knowledge is requisite both for dissection and suture.

Femoral hernia is another complication of inguinal hernia. While this coincidence is perhaps more common in women, it must always be thought of in men. If not occasionally men will return complaining of recurrence. Examination soon discloses the presence of a femoral hernia but it is difficult to explain this to the patient. It is not unlikely that the femoral hernia was overlooked at the time of the operation for inguinal hernia.

It is in the region subject to direct hernia and of the external ring that failures are most apt to occur. It is over this region that we have had our Bassini and Ferguson arguments. I believe that in every case the cord and vessels should be transplanted completely as far as the deep fascia and muscles are concerned leaving the cord covered only by the superficial fascia, fat, and skin. This procedure is not uncommonly advocated in difficult cases where there is congenital or atrophied absence of tissue in the lower portion of the inguinal canal, and where the operator fears the recurrence of a direct hernia. Here all possible tissue is desired to close in the defect. While all of the external oblique has thus often been placed below the cord in special cases, I have never seen it advocated as a routine measure in all inguinal hernias or at least up to 2 years ago when I reviewed the literature.

Technically, complete transplantation, as I call it, is the simplest procedure. No thought need be given to pressure on the cord or vessels and resultant congestion or to the formation of an external ring from rather rigid tissue as the external oblique. No part of the external oblique is needed as a covering. The cord is not sensitive as is the testicle or liable to injury as is the epididymis. When the cord passes over the pubis, it has even less covering and that against a hard background.

I think I am safe in saying that since the days of Bassini and, in spite of notable exceptions, the tendency of accumulated experience has been toward more radical transplantation. I quote from Halsted, *Annals of Surgery*, 1919, July: "When I first transplanted the rectus in order to suture it to Poupart's ligament and thus strengthened the defect

in the lower angle of the wound due to obliteration of the conjoined tendon, I also transplanted the cord and excised the veins as in the Halsted operation. Since my publication in 1899 we have discontinued transplanting the cord and rarely excise the veins. As far as I have been able to ascertain, in the group in which I had transplanted the cord, there has been only one recurrence, but since the change in technique of leaving the cord undisturbed in the lower angle of the wound, I know of at least four recurrences in operations which I performed myself, and it seems strange that this has made no impression."

Passing to the question of suturing the muscles and fascia we remember that the general action of the muscles of the inguinal region is a backward and upward pull. These muscles have a purchase on Poupart's ligament and the pubic bone. This muscle mass of rectus, internal oblique, and conjoined tendon must be sutured to Poupart's without strain. The common device has been severing the fascia of the rectus near its fusion with the external oblique, beginning at the pubis and extending as far upward as necessary. I am thus routinely freeing the rectus with increasing frequency and for a greater distance, in cases of double herniotomy. Personally I have not seen nor found in the literature any ill effects in the form of weakness of the abdomen at the point of section.

It is perhaps trivial to mention sutures and yet Torek deems it of sufficient importance to discuss. The tissues are placed in an unusual position and undoubtedly there is greater dependence on interrupted than continuous sutures. In case of infection the continuous suture acts as line of least resistance spreading what otherwise nature might wall off.

During the last 5 years I have completely transplanted the cord in every case of inguinal hernia and have come to an almost routine freeing of the rectus. Leaving out the last 12 months and taking the period of the four previous years I have had an opportunity to test this technique in 84 cases, in 21 of which there was a double herniotomy, or a total of 105 inguinal operations. I have heard from all but 4 of these patients. Of course the other surgeon may have seen them, but patients recognize that hernial work is mechanical and as in fracture work they are apt to keep in touch with the doctor. Furthermore if there are to be recurrences they are apt to come very soon. Aside from the rare cases of failure of tissue healing or infection it is not unreasonable to strive to approximate 100 per cent cures in inguinal hernia.

Dr. R. D. Kennedy, in discussion, referred to the prognostic importance of the physical condition of the patient and favored the simple operation for most cases.

Dr. Frank E. Bunts congratulated the essayist and stated that in most cases he does not transplant the cord and favors opening the sac at the internal ring. In cases of true inguinal hernia, he favors transposition of the cord but does not do so in simple cases. He is opposed to operating on a relaxed ring on the opposite side unless very definitely indicated, as it exposes the patient to the possibility of infection and the necessity for re-operation, which is almost always unsatisfactory. He does not favor cutting into the peritoneum and inserting the finger to deliver the sac, as practiced by some operators, as he thinks this adds to the danger of infection.

Dr. Polak emphasized the importance of proper management of the lower end of the wound when operating on inguinal hernia, complicated with femoral hernia.

Dr. Dennis J. Hayes mentioned two cases of testicular atrophy following transposition of the cord. Dr. J. G. MacDougall emphasized the conservation of the nerve supply with attention to the finer details of technique. Secondary pain might be due to incarceration of nerves and secondary atrophy might be due to the same cause. Sutures should not be too tight, and he agreed with Dr. Bunts about unnecessary operating on relaxed ring on the other side. He thought hernia essentially a congenital condition and not due primarily to a relaxed ring. He did not practice transposition as a routine measure and thought it not necessary if the sac is properly tied off and favored operation early in life where indicated.

Dr. T. Casey Witherspoon spoke of the anatomical relations of the sac, showing how a short, tense, conjoined tendon favored the formation of a hernia, while if it was loose, it would act as a preventive. He felt that the so-called potential hernia had practically no significance and that most hernias were essentially congenital.

Dr. J. R. Espey was of the opinion that an operation on one side tended to weaken the other and might be the cause of hernia in predisposed cases. He also favored the congenital idea which, if present on one side, was more than likely to be on the other. He thought femoral hernia might be the result of inguinal operation in predisposed cases. He did not think transposition of particular importance, but emphasized the conservation of nerve structures.

Dr. J. T. Harrington asked about removing the appendix at the same operation, and Dr. W. A. Rohlf inquired as to the suture material.

Dr. Earl, in closing, opposed the removal of the appendix unless definitely indicated; he uses chromic catgut in the deeper structures and plain in the superficial, and was inclined to think that the atrophy mentioned was more likely caused either by a malposition of fat or to pressure above the internal abdominal ring.

PAIN; ITS SURGICAL SIGNIFICANCE

The subject of pain, its surgical significance, was taken up at the April 6 session and discussed by Dr. J. M. Patton, Omaha, Nebraska assisted by Drs. Barnhill, Kennedy, Sulzman, Smith, Reaves, and Witherspoon. Dr. Patton quoted

the objective of the physician, as given by Hippocrates, as "relief of pain" and "prolonging of human life." He recognized the advantage of specialization but urged the men engaged in general and special surgery to keep sufficiently in touch with their colleagues in all fields of surgery so that they may recognize the progress that is made from time to time and thus give their patients the benefit of surgical progress in all lines. He stated that the purpose of the meeting was to present clearly the character and location of pain secondary to surgical lesions in the respective fields represented so they may be promptly recognized by the surgeon, and the patient advised accordingly. He then called attention to the severe prostrating neuralgic pain of acute glaucoma, often associated with nausea and epigastric pain. Sometimes the ocular discomfort is negligible, or the above symptoms so severe as to cause the patient and the physician to disregard the eye until it is beyond hope of recovery. A beginning iritis may be mistaken for a conjunctivitis, until pain, worse in the after part of the night, confirms the diagnosis. If the eye is tender on palpation, a complicating cyclitis is almost sure to be present. Soreness on rotating the eyeball suggests tenonitis and should institute a search for foci of infection. Headaches and eye aches, coming on after use of the eye are easily localized, but the postural pain in the back of the neck and between the shoulders is not so easily recognized, and careful examination of refraction and muscle balance should be made if pain of this nature is not otherwise accounted for.

Dr. J. F. Barnhill, of Indianapolis, discussed pain due to lesions of the intracranial structures.

Pain in the head due to intracranial infections is called headache. Headaches are one of the most prominent complaints and one of the most difficult problems. When pain is dull and recurring, it is most characteristic of pressure; when piercing, of inflammation and pressure. Tumors of the brain of all kinds cause pressure headaches which are very persistent. What is the origin of this pain? The only sensitive structure in the cranium is the dura mater which is supplied by fibers of the fifth nerve. It is very sensitive to pulling and pushing, but not to cuts or injury. Suddenness of pressure has much to do with pain. Acute pain results from rapid transfusion of fluids into the ventricles or subdurally.

Position of the tumor has more influence on pain than size. If tumors are centrally situated there is a cushion of brain substance between them and the dura; hence there may be little pain. On the other hand, a small tumor may block the entrance to a ventricle and cause back pressure. In inflammatory cases there is always pain due to large fluid exudate and pressure combined with inflammation.

Tumors of the hypotphysis are accompanied by pain and a gradual onset of blindness.

Gasserian ganglion pain is recorded as being without the skull; but all information shows that the disease is really in the ganglion.

Dr. Kennedy: Pain in the joints and back:

1. Pain felt on the dorsum of the foot is frequently due to the falling of the anterior arch of the foot. This is increased by standing and one feels as if a nerve were being pinched in the foot. Diagnostic point: if one elevates the arch of the foot he finds the patient unable to flex the toes.

2. Pain in the calf of the leg frequently due to falling of the posterior arch. Bending of foot inward increases the pain.

3. Pain in the knee may be due to hip-joint disease or dislocation of the cartillage. If internal, the knee becomes locked and pain is on the inside. If external, the joint is not locked and the pain is external.

4. Hip-joint disease, accompanied by a limp, causes pain in the hip joint.

5. Pain in the back. There are many causes: focal infection, elongation of process of last lumbar vertebra; adhesion of muscle to muscle sheaths; or strains of cervicodorsal joints. A patient who holds the lower four lumbar joints rigid and has pain on bending probably has muscular adhesions. This is the reason for the success of the chiropractor with these cases. In women we may have postural pain due to lordosis from wearing high heels.

Dr. Sulzman: In the case of a patient with pain in the ear how can we determine the seat of lesion?

If in the examination the patient endeavors to move away when the auricle is touched, pain is constant and worse when the mouth is opened and closed, the lesion is in the external canal and the diagnosis is acute otitis externa.

If no pain is noticed when the finger is pressed gently over the mastoid, but pain is present upon pressure up and inward under the lobe of the ear(the pain itself being either constant or intermittent) the trouble is in the middle ear. Mastoid pain varies with the type of bone which is being dealt with. The pneumatic or ebony type will each have special symptoms.

In the pneumatic type the pain on pressure may be great but the patient will complain very little as the pus has found an easy passage toward the cortex.

In the ebony type the patient complains of much pain, and pressure will not reveal it until later in the course of the disease.

Still another type of pain about the mastoid may become apparent. Pain is brought about by pressure. Examination of the canal and middle ear show no true ear involvement. An otalgia might be dealt with and the foci of infection must be looked for in the tonsils or teeth or other parts of the body. A mastoid operation is unnecessary.

Pain between the eyes, worse when stooping over, constant or intermittent, coming on in some regularly and leaving after a regular period indicates a serious condition. When pus is present the discharge and other pain symptoms are an aid.

Pain in swallowing and difficulty in opening the mouth are indications of quinsy. Pain in swallowing

and ability to open the mouth may be considered an acute follicular tonsillitis, foreign body, or retropharyngeal abscess. Pain in swallowing with or without the pressure of cough or loss in weight usually indicates a condition about the larynx, foreign body, tuberculosis, syphilis or a neoplasm. A further careful examination, history taking, and proper laboratory examination will clear up any question as to diagnosis.

Dr. R. R. Smith: As a rule pain in distal regions of the body is not due to gynecological affections. Pain in the back is rarely due to pelvic troubles. Pain of acute pelvic trouble, as ectopic, infected tube, etc., is rather characteristic. Benign neoplasms of the pelvis do not usually cause pain unless complicated, as with fibroids when efforts at expulsion are made. Malignant tumors are painful only in the later stage. Chronic inflammatory disease may cause pain in the lower abdomen, groin, or genitals. Simple malpositions and simple laceration give little pain or symptoms. Discomfort and pain are usually due to other causes. A large subinvoluted uterus or one in malposition with inflammation may cause pain and discomfort. Prolapse causes discomfort increasing with years. If there is nothing definitely pathological in the pelvis, beware of locating seat of pain there.

Dr. J. U. Reaves, of Mobile, Alabama: Tenderness upon pressure is apparent in inflammatory conditions of the kidney, either acute or chronic. Normally the kidney, which is located wholly beneath the ribs, is not perceptible to palpation, as the kidney may be felt only in the presence of undue renal mobility or enlargement.

If spontaneous pain in the kidney region is complained of by the patient, examination will reveal that the points of tenderness are situated over the kidney posteriorly, and over the ureter anteriorly. The two posterior painful points over the kidney will be at the costovertebral angle, and where the tenth rib joins the sacrolumbar muscles. The anterior painful points will be at the costorectus junction, at the lateral border of the rectus, lateral to the umbilicus, and at a point midway between the umbilicus and the pubes at the outer border of the rectus. This point may also be located by a line drawn between the two anterior superior spines on the ilia at the outer border of the rectus muscle, over the point where the ureters cross the brim of the pelvis as they enter. Another painful spot most frequently caused by impacted stone in the ureter is in the inguinal region at the external opening of the inguinal canal and refers downward to the testicle and upward and outward over the crest of the ilium to the lumbar region. It must be remembered that kidney pain is sometimes complained of on the side opposite from the location of the involvement.

Remote points of tenderness are the supra-intraspinous point located just above and within the anterior superior spine of the ilium. Pressure upon this point is exerted upon the external cutaneous nerve and points reflexly to a disordered condition of the kidney. This point is considered by Pasteau to be the most constant of all points of renal tenderness: the lateral supra-iliac point, situated 1 centimeter above the crest of the ilium and corresponds to the point of issue of the perforating branch of the last intercostal nerve. Pain is also referred down the center of the thigh on the affected side. As the sympathetic nervous system supplies all hollow organs and tubes, the genito-urinary organs come in for a good supply of sympathetic nerve fibers, and excrutiating pain of the genito-urinary organs, from any cause, produces vomiting reflexly through the solar plexus. This nausea and vomiting are common symptoms associated with severe pain in the genito-urinary tract.

Bladder pain is located behind the pubes or suprapubically and is referred down the urethra its entire length, and posteriorly to the lumbar region.

Pain at the beginning of micturition, in the anterior urethra, especially in the fossa navicularis, is of the anterior urethra; this same pain at the end of micturition is a referred pain from the posterior urethra. Deep pain at the end of micturition is either of the prostate or seminal vesicles.

Pain caused by conditions in the prostate is centered around the anus and perineum, but is referred to the lower lumbar and upper sacral region. This also applies to pain originating from the seminal vesicles. The adjacent involvement of the posterior urethra in these conditions is referred down the urethra to the fossa navicularis. Involvement of Cowper's gland causes pain at the scrotoperineal junction and is referred down the urethra.

Pain in the vas is first felt at the internal inguinal ring, and radiates with the disease to the epididymis. Testicular pain centers over the testes involved, and is referred up the cord, over the crest of the ilium to the lumbar region and through the sympathetic system to the stomach.

In conclusion I wish to state, that pain is not the most dreaded symptom in genito-urinary diseases, but that of a hæmaturia which is symptomless. In all cases of hæmaturia the patient should be urged to consult a cystoscopist at once for a diagnosis, while the hæmaturia is still present so the bleeding point can be easily detected and a diagnosis made of whatever condition is causing the hæmaturia. This point cannot be emphasized too strongly. In cancer of the kidney, hæmaturia may appear early and be the only symptom. This is also true of cancer of the bladder and adnexa. In renal calculus, hæmaturia often appears abruptly and without any previous attack of pain. Pain is not always a prominent feature of kidney stone, for some stones produce absolutely no pain.

Dr. Witherspoon: Pains in the chest and upper abdominal region, are fundamentally divided into visceral wall and nerve pain. The nerve supply corresponds largely to the segmentation of the cord.

Pain should be diagnosed as to source, whether visceral, somatic, or central. Pain in the upper

abdomen naturally refers to the viscera, gall bladder, etc. Viscera are not sensitive to touch or injury. Visceral pain is located in the soma, supplied by the same vertebra segment which supplies the viscus; but the pain may be referred to the opposite side or transposed vertically. Pain in the pleura may be referred to the abdominal wall because of the dorsal nerves which go to the abdominal wall.

DR. BECK: Pain should be relieved; but when it is of diagnostic value not until diagnosis is made.

SURGICAL PROCEDURES IN NON-PERFORATING PYLORIC ULCERS

On April 9, DR. T. C. WITHERSPOON, of Butte, Montana, presented a paper on "Surgical Procedures in Non-Perforating Pyloric Ulcers":

Non-blocking ulcer or ulcer scar of the stomach is not a surgical disease of itself. This lesion should be treated by the internist with some well-directed measure. It is only in cases of perforation, repeated hæmorrhage, unyielding pain or symptoms, and suspected malignancy that direct operative measures are indicated. Lesser operative procedures, remote from the lesion, are indicated whenever a focal infection is found which might have been instrumental in ulcer development. Tonsils and teeth are especially to be questioned.

Attention is especially directed to the usefulness of a suprapubic drain after closure of a stomach or duodenal perforation. While the infection of the peritoneum is mild in these cases, it is well to provide a low drain in all such conditions.

Gastro-enterostomy and pyloroplasty are done fundamentally for bettering stomach drainage. They are indicated in mechanical block at the pylorus. Of the two procedures, gastro-enterostomy is safer, more easily performed as a rule, insures better stomach drain, and is usually the operation of choice. If adhesions form about the stomach wound they are harmless following gastro-enterostomy, but often symptom-producing after pyloroplasty. Pyloroplasty simply maintains a physiological route but in case of duodenal ulcer, there is no relief from food traumatizing or chemical irritation of the ulcer.

In simple perforation of stomach or duodenum where no pyloric block exists, there is no indication for gastro enterostomy as supplementary to the closure of the ulcer. This would only entail a prolonged operation, an irritation of handled viscera and an increased danger from spread of infection.

Removal of an ulcer area is good surgery whether gastro-enterostomy or pyloroplasty is done.

DR. W. A. KICKLAND opened the discussion. He mentioned eight cases of acute perforation, in which one patient with pyloroplasty died and one recovered after a secondary operation for subphrenic abscess. Six cases of gastro-enterostomy resulted in satisfactory recoveries.

DR. F. N. G. STARR thought the procedure depended on the type of ulcer. In the case of an acute perforation, he advised sewing up and locating the focus of infection. Where induration is present, he advised gastro-enterostomy, and if there is no perforation, he advised against drainage.

DR. JUAN POU ORFILA preferred gastro-enterostomy if the condition of the patient permits.

DR. EARL thought a definite ulcer should be excised and, in suitable cases, felt that pyloroplasty was safer than gastro-enterostomy. He called attention to the fact that obstruction of the distal end of the duodenum may be the cause of the ulcer and at times may require duodenal enterostomy.

DR. R. M. HOWARD expressed the belief that the non-obstructive ulcer is the difficult problem, and that gastric ulcers are worse than those of the duodenal type and not so easily relieved by gastro-enterostomy. He favored cauterization as well as excision and stated that careful diet and management are of the greatest importance.

DR. EMIL BECK favored excision whenever possible and advised gastro-enterostomy when much induration was present.

DR. L. H. HAMILTON called attention to the duodenal end, urging thorough examination, especially of the distal third, and with Dr. Earl, favored duodenal anastomosis.

In closing, DR. WITHERSPOON restated that it was usually the small, round, acute ulcers that perforated. He did not advise pyloroplasty in the usual case; favored median abdominal drainage, if at all indicated; and urged a very careful and thorough closure of the ulcer.

EXAMINATION, DIAGNOSIS, AND TREATMENT OF RECTAL DISEASES

DR. F. E. DAVID, of Chicago, presented a paper on "Examination, Diagnosis, and Treatment of Some Rectal Diseases": If we wish to have the opportunity to cure more cases of carcinoma of the rectum, we must so perfect our technique in the minor troubles that patients will not fear to consult the surgeon.

As in other diseases the written history is necessary. In writing the history the important points to consider are:

1. History—(a) Age; (b) Duration of symptoms (c) Protrusion—character, time of occurrence, recurrence; (d) Hæmorrhage (as above); (e) Discharge; (f) Pain—character, time constant, intermittent.

2. Symptomatology—(a) Fissure; (b) Irritable ulcer; (c) Hæmorrhoids; (d) Carcinoma; (e) Perirectal abscess; (f) Fistula; (g) Pruritus ani.

Usually the complications, not hæmorrhoids (except those of acute thrombotic or extremely hæmorrhagic type) cause patients to consult the surgeon; there are comparatively few uncomplicated cases of hæmorrhoids. Hence the necessity for searching for that which, if not found, prevents a cure.

3. Examination—left lateral position.

4. Instruments for examination—(a) Small conical speculum; (b) proctoscope; (c) probes; flexible

small diameter, straight, and reverse, in examination of fistula.

5. Preparations for operation.

6. Selection of anæsthetic—Gas, oxygen or gas, ether in deep perirectal abscess. Local anæsthesia in 90 to 95 per cent of other cases. Why?

7. Technique of operation in—(a) Fissure; (b) Ulcer; (c) Hæmorrhoids; (d) Perirectal abscess; (e) Fistula; (f) Pruritis ani.

8. Postoperative treatment.

DEEP ROENTGEN AND RADIUM THERAPY

Dr. James T. Case, of Battle Creek, Michigan, gave an excellent talk on the present status of deep roentgen and radium therapy in which he called attention to the very recent advances in our knowledge of roentgentherapy, especially during the last five years. He deplored the tendency of medical men to acquire their knowledge of X-ray technique from traveling salesmen and urged a careful study of the subject from reliable sources. He emphasized the importance of accurate measurement of dosage by means of the electroscope and believed that radium was more useful for the deeper structures, uterus, etc., and the X-ray better adapted for superficial work. He then systematically considered the following points:

1. The law of the inverse square. For example, it requires eight times longer to produce the same dosage at 8 centimeters than at 4 centimeters.

2. Penetration of the X-ray depends on the voltage, diagnosis requiring from 60 to 85 kilo-volts while treatment requires from 50 to 250 kilo-volts. He explained the relative position of X-ray and radium with their various rays and compared the X-ray tube to a battle ship with its various sizes of armament. As the X-ray tube shoots all its batteries at once, the necessity of filters is readily seen. Dr. Case explained the various types of filters and their importance and indication. Under the fourth head, he discussed the question of secondary radiation under which he considered: (a) secondary characteristic; (b) scattering radiation; (c) secondary pale rays. He urged careful planning of dosage in roentgentherapy and considered it of greatest importance.

In discussing radium, the essayist said that in early carcinoma of the cervix the use of radium was perhaps better than surgery, but in order to accomplish satisfactory results, it must be used in large doses. He also urged the importance of accurate clinical diagnosis before applying deep therapy and stated that in certain cases the rays apparently had a harmful effect on the intestinal and gastric functions. He preferred X-ray for cancer of the larynx and œsophagus as he felt that mechanical irritation from the introduction of the radium sometimes did more harm than good. In replying to a question by Dr. Boldt as to the effect of irritative doses of radium in cases of amenorrhœa, Dr. Case did not think it really had much effect either one way or the other on blood conditions.

IMMUNITY AND ITS RELATION TO SURGERY

On April 11, the closing day for the general sessions, Dr. Emil G. Beck, of Chicago, presented a lecture on "Immunity and Its Relation to Surgery":

Every individual when born possesses a slight degree of immunity against all diseases, the so-called inherited immunity. During his life he acquires an additional immunity to such diseases as exist in his surroundings, either by small repeated doses of infection so slight as not to cause even susceptible symptoms or by passing through an attack of a disease. The degree of immunity and its duration vary greatly. An attack of mumps, for instance, immunizes the individual for life time, while measles or typhoid immunize only for a short period. There is as yet no practical way of measuring by chemical or biological test the immunity of an individual against a certain disease. The Shick test or the opsonic index has come nearest to it. Besides this acquired immunity we may produce it artificially, by injection of sera vaccination or by raising the resistance of the individual by treatment, fresh air, rest, feeding, and medication. This is what medical treatment actually does; but at times the patient does not respond to all these measures. He grows worse in spite of all, because the production of antibodies does not keep pace with the rapid work of the invading micro-organisms.

What can surgery do to produce immunity? It can do a great deal and does so in many operations. For convenience of illustration if we represent the degree of immunity of an individual by a number which would approximately indicate the degree of immunity, and also represent by other figures the amount of disease present (make a ledger with a debit and credit account, the disease figure on the debit side and the immunity on the credit side), the difference in the balance will indicate the status of the patients' condition and the comparative proportion between the disease and recuperative power.

Let us illustrate by a case of tuberculosis of the kidney—

Debit		Credit	
Right Kidney	20	Immunity developed	15
Left Kidney	5	Immunity developed	3
Bladder	5	Immunity developed	3
Lung	8	Immunity developed	5
Scattered	5	Immunity developed	3
Total	43	Total	29

Total deficiency of immunity 14.

This patient needs 14 units of immunity substances to overbalance the progress of the disease.

What does the surgeon do to bring it about? He removes the right kidney which changes the figure on the debit side from 43 to 23, while the credit side remains the same. The patient has now six units of immunity to spare. The removal of a large part of the disease releases immunity bodies which can now operate in other regions of the body and attack the ruining disease.

This theory is illustrated in the practice of everyone. You will recall cases in which sinuses were present in many regions of the body and after amputation of the very much diseased limb, the sinuses closed spontaneously and the patient gained rapidly in weight.

When a tuberculous kidney is removed and the bladder is known to be affected also, a rapid improvement is often noted not only in the general condition but also in the bladder.

We have kept track of many cases of this kind and have checked up the findings from time to time, with roentgenogram and have found that the facts fit the theory in almost every instance.

In the discussion, DR. C. C. SWEET, of Ossining, New York, asked why influenza, instead of producing immunity rather predisposes to another attack. Dr. E. R. Secord stated that, according to records, typhoid fever may recur up to the end of a year but it is not likely to do so after that period; also that children with joint or gland tuberculosis do not, as a rule, develop the pulmonary type of that disease.

DR. T. H. CULHANE, of Rockford, Illinois, referred to the fact that so many apparently healthy soldiers succumbed to influenza in 1918, while their otherwise less healthy companions with less virulent conditions such as measles, asthma, etc., seemed to a certain extent to have immunity to influenza. He mentioned a case of sarcoma that disappeared after a severe attack of measles, and a most intractable case of malaria that cleared entirely after the unfortunate victim almost succeeded in committing suicide by taking illuminating gas.

In closing, Dr. Beck explained that the principle as stated did not apply to Hodgkin's disease, and that as a rule removal of the glands predisposed to more rapid recurrence. It was his opinion that all other diseases produced a certain amount of immunity. He had observed that tubercular joint conditions do not improve on the removal of surgical tubercular lesions elsewhere in the body, and as a rule patients with joint tuberculosis do not have pulmonary tuberculous trouble. He sincerely hoped that some quantitative test for immunity might be developed, because it would be of the utmost value from a surgical standpoint.

CLOSING MESSAGE

BY DR. CHARLES D. SCHAEFFER, CHAIRMAN

We are now reaching the end of our wonderful cruise, so well arranged and prepared for our pleasure and education by the American College of Surgeons. At this moment we have within us a sense of joy mingled with a feeling of regret. We sincerely regret that the ties of friendship formed during this cruise are about to be undone; that they cannot longer continue the same. On the other hand, we rejoice that we have had the exceptional opportunity of enjoying the wonderful advantages of this cruise, so well thought out and executed by one of the greatest American physicians, who heads the College of Surgeons. Each return of this day must of necessity bring to him more flowers and sweeter, more songs and higher, and yet deeper and wiser meditations.

As I am here before you in the closing hour of our frequent meetings, I wish to thank the members of the Committee on Scientific Meetings and the participants in the discussions; especially do I wish to express my appreciation to Dr. Patton for his valuable assistance and co-operation in arranging these programs. As to whether or not these meetings were a success must be left to your judgment. They were always well attended and the papers with their discussions indicated a great interest in the rapid progress of our science. Each one attempted to advance new ideas and methods of operation for the purpose of educating his confrères, that they, in turn, may apply them to relieve suffering humanity. No walk in life can boast of greater progress.

Were a Calvin or a Jonathan Edwards to be recalled to life at this moment, he could discourse to us as learnedly as ever on Predestination and Free Will; a great preacher, a Spurgeon or a Beecher, could at this very moment stir our souls and warm our hearts as of old; a great jurist, a Justinian or a Marshall, could today expound the same principles of law which practically hold good for all time; a great orator, a Webster or a Burke, could this very moment convince us with the same arguments and arouse us with the same invectives which made our forefathers willing captives to silvery tongues; but so great has been the progress in surgery that were a Sam Gross, a Senn, a Fenger, a Cooper, an Agnew or an Ashhurst, all of whom died within our day, now recalled before us, he could not teach modern surgical principles, nor could he perform a modern surgical operation. Our operations on the head, the chest, and the abdomen would cause these men to wonder whether we had not lost our senses.

This progress was largely made possible through the discoveries of that famous English surgeon, Lord Lister; and when the members of the British Medical Association at Montreal, and of the International Convention at Berlin, arose *en masse* and welcomed him with cheer after cheer, it was but a feeble expression of gratitude for a service to humanity which no words can desribe. No fame, no praise, no reward is too great for such men.

The unselfish motive which prompted Lord Lister may well be compared to that of our Director-General, who conceived this cruise in order to spread into foreign countries the principles which underlie this noble institution. We should therefore go to Chicago next October and convince the officials of the College that we stand back of them, and that we propose to encourage this work so that the institution may become the most gigantic factor in the Western Hemisphere for the education of surgeons. Therefore, let us all plan a visit to Chicago next Autumn for a general reunion.

Before adjourning, however, as we all have within us a profound sense of gratitude for what our Director-General has done for us, let us give him a standing vote of thanks.

PENNSYLVANIA, NEW JERSEY, AND DELAWARE; NEW YORK; MARITIME PROVINCES; AND NEW ENGLAND SECTIONAL MEETINGS OF THE CLINICAL CONGRESS

PENNSYLVANIA, NEW JERSEY AND DELAWARE

THE sectional meeting of the Clinical Congress of American College of Surgeons for the states of Pennsylvania, New Jersey, and Delaware was held at Wilkes-Barre, April 30 and May 1. Headquarters and registration rooms were at the Sterling Hotel.

All meetings and clinics were well attended and the programs were received with enthusiasm and interest. The Hospital Meeting and the Round Table Conference were held in the Ball Room of the Sterling Hotel at 2:00 p.m., on the first day and were followed by the meeting of the Fellows, when the election of the State Executives for the ensuing year took place. The following were elected:

Pennsylvania

Chairman—J. L. Atlee, Lancaster
Secretary—S. P. Mengel, Wilkes-Barre
Counselor—J. J. Buchanan, Pittsburgh

New Jersey

Chairman—B. Van D. Hedges, Plainfield
Secretary—George W. Sexsmith, Bayonne
Counselor—James S. Green, Elizabeth

The evening Public Meeting was held in the Irem Temple. This beautiful auditorium, one of the finest in the country, was crowded with an attentive audience. The program which began with an organ recital was promptly carried out. The Scientific Program on the second afternoon was especially interesting. All hospital clinics were well attended and showed careful preparation. Everyone sincerely regretted the absence of Dr. C. D. Schaeffer of Allentown, the State Chairman, who, because of illness, was unable to be present. Dr. L. H. Taylor of Wilkes-Barre very ably took the Chairman's place at the meetings.

To the energetic efforts of Dr. S. P. Mengel and the Local Committee on Arrangements is largely due the splendid success of these meetings.

NEW YORK

THE New York State sectional meeting for 1923 was held in Syracuse May 7 and 8. The Hospital and Scientific Meetings, in the Ball Room of the Onendaga Hotel, were particularly well attended. The Public Meeting was held in the Mispah Auditorium.

At the meeting of the Fellows of the College following the Hospital Conference the state officers were elected for the next year:

Chairman—Edwin M. Stanton, Schenectady
Secretary—Arthur J. Bedell, Albany
Counselor—John O. Polak, Brooklyn

Clinics and surgical demonstrations were held at the local hospitals. As Syracuse is a medical teaching center, it was particularly well equipped for this purpose. The success of the meetings was due to the energetic efforts of Dr. G. M. Price, Dr. F. Flaherty, and the local committee. The thanks of the College is due also to the local press and to many others who ably assisted in carrying on the 1923 Sectional Meeting in Syracuse.

MARITIME PROVINCES

THE 1923 sectional meeting for the Maritime Provinces was held in St. Johns, New Brunswick, on May 11 and 12. Fellows of the College and those interested in hospital work were present and all three provinces were represented. Registration headquarters was at the Royal Hotel. The Hospital Conference and Scientific Meetings were held in the Y. M. C. A. Auditorium.

Dr. Walter W. White presided at all the sessions. There was a good attendance and much interesting discussion. The Public Meeting held in the Centenary Church at night was attended by a large and a very enthusiastic audience interested in better hospitals and better health. The clinics and demonstrations at the hospitals were well prepared and of great interest.

To the efforts of the Local Committee, of which Dr. W. W. White was Chairman, is due the success of these meetings.

The following Maritime Executives were elected for next year:

Chairman—Alexander MacNeill, Summerside, P. E. I.
Secretary—John H. Allingham, St. Johns, N. B.
Counselor—George H. Murphy, Halifax, N. S.

HOSPITAL MEETING, BANGOR, MAINE

ON Sunday evening, May 13, 1923, a large Hospital Meeting was held in the City Hall, Bangor, Maine. The auditorium was crowded. The Mayor and local hospital di-

rectors occupied the stage. Music was supplied by the High School orchestra of 20 pieces.

Addresses were delivered by the Mayor, Dr. M. T. MacEachern, president-elect of the American Hospital Association, Father Thomas F. Nelligan, and Dr. Allan Craig, of Chicago, associate director of the American College of Surgeons. Dr. Daniel McCann presided.

The success of this meeting was largely due to the efforts of Dr. Eugene Sanger and his associates, who have always taken a keen interest in hospital efficiency.

NEW ENGLAND STATES

THE New England States Sectional Meeting of the American College of Surgeons was held in Worcester, Massachusetts, on May 15 and 16. Here was one of the largest, if not the largest, sectional meeting the College has ever had. Both afternoon and evening, the Ball Room of the Bancroft Hotel was crowded by a splendid audience. The Scientific Meeting also drew a large attendance and was full of interesting discussion. The hospital clinics were all well attended. There were 175 registrations.

Dr. Homer Gage was presiding officer, and Dr. Kendall Emerson with the Committee on Arrangements spared no efforts in making the meetings successful and worth while to everyone.

The following State Committees were elected for the coming year:

Massachusetts

Chairman—H. G. Stetson, Greenfield
Secretary—E. L. Hunt, Worcester
Counselor—Frank H. Lahey, Boston

Connecticut

Chairman—Charles C. Godfrey, Bridgeport
Secretary—Samuel C. Harvey, New Haven
Counselor—John B. Boucher, Hartford

Maine

Chairman—William Bradford, Portland
Secretary—Carl Robinson, Portland
Counselor—E.B. Sanger, Bangor

New Hampshire

Chairman—Ira J. Prouty, Keene
Secretary—James W. Jameson, Concord
Counselor—John H. Gleason, Manchester

Vermont

Chairman—E. T. Brown, Burlington
Secretary—W. W. Townsend, Burlington
Counselor—William Stickney, Rutland

Rhode Island

Chairman—John W. Keefe, Providence
Secretary—Frederick V. Hussey, Providence
Counselor—A. T. Jones, Providence

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

THIRTEENTH ANNUAL SESSION, CHICAGO, OCTOBER 22–26, 1923

HARVEY CUSHING, Boston, *President* ALBERT J. OCHSNER, Chicago, *President-Elect*
FRANKLIN H. MARTIN, Chicago, *Director-General*

LOCAL EXECUTIVE COMMITTEE

ALLEN B. KANAVEL, *Chairman*

FREDERIC A. BESLEY
JOHN A. CAVANAUGH
ARTHUR H. CURTIS
CARL B. DAVIS
CHARLES DAVISON
E. K. FINDLAY
GILBERT FITZ-PATRICK
IRA FRANK
HERMAN L. KRETSCHMER
PHILIP KREUSCHER
NELSON M. PERCY
HERBERT A. POTTS

THE thirteenth annual session of the Clinical Congress of the American College of Surgeons will be held in Chicago, beginning Monday, October 22, and ending on Friday, October 26, 1923. The plans for the Chicago meeting, which is the fourth session of the Clinical Congress to be held in this city, conform in a general way to those of recent sessions, the morning and afternoon hours of the four days, Tuesday to Friday inclusive, being devoted to clinical demonstrations in the hospitals and medical schools, and the evenings to scientific programs.

A conference on the hospital standardization program of the College and the many problems related thereto will occupy the morning and afternoon hours on Monday, the program consisting of papers and discussions by surgeons, hospital superintendents, nurses, trustees, and others interested in the conduct of hospitals.

The first formal session of the Congress is the Presidential Meeting to be held in Orchestra Hall on Monday evening, on which occasion the President-Elect, Dr. Albert J. Ochsner, will be inaugurated and deliver the annual address.

The local Committee on Arrangements, composed of representative surgeons of Chicago, is preparing a program of clinics and demonstrations to be given in the hospitals and medical schools during the four days, Tuesday to Friday inclusive, which will completely present the clinical activities of this great medical center. All departments of surgery will be represented therein, including gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, throat, and mouth, experimental surgery, surgical pathology, roentgenology, etc.

For the scientific meetings to be held in the ballroom of the Congress Hotel on Tuesday, Wednesday, and Thursday evenings a program of papers and discussions dealing with surgical subjects of timely interest is being prepared by the Executive Committee of the Congress. The speakers will include a number of eminent surgeons from Europe and South America together with distinguished surgeons of the United States and Canada.

The eleventh convocation of the American College of Surgeons will be held on Friday evening, when Fellowship in the College will be conferred upon a group of American and Canadian surgeons and honorary Fellowship upon distinguished foreign guests.

General headquarters for the Congress will be established at the Congress Hotel where the ballroom, Florentine, Elizabethan and St. Francis rooms, together with the foyers and other rooms adjacent thereto on the first and second floors, have been reserved for the exclusive use of the Congress. These rooms will be utilized for evening meetings, registration and ticket bureaus, bulletin rooms, etc.

An application for reduced railway rates on account of this meeting is pending with the railway passenger associations and it seems assured

that a substantial reduction in fares will be granted, applying to all portions of the United States and Canada.

CHICAGO HOTELS AND THEIR RATES

While the hotels of Chicago have a large capacity for the entertainment of visitors, it is well for those expecting to attend the Congress to make reservation of hotel accommodations at the earliest possible date. The following hotels are recommended by the local committee:

Hotel	Minimum Rate Single Room With Bath	Without Bath
Atlantic	$3.50	$2.00
Auditorium	5.00	2.50
Blackstone	5.00	4.00
Brevoort	3.00	2.00
Chicago-Beach	4.00	3.00
Congress Hotel	4.00	3.00
Cooper-Carlton	3.50	....
Del Prado	2.50	....
Drake	5.00	....
Edgewater Beach	3.00	....
Fort Dearborn	2.45	1.95
Great Northern	3.50	2.50
LaSalle	4.00	2.50
Lexington	3.00	2.00
Morrison	4.00	....
Planters	3.00	2.00
Sherman	3.00	2.00

LIMITED ATTENDANCE—ADVANCE REGISTRATION

Because of the popularity of these annual clinical meetings it has been found necessary in recent years to adopt the plan of limiting attendance. This plan necessitates registration in advance on the part of all who wish to attend. The limit of attendance will be based upon the result of a survey of the amphitheaters, lecture rooms, and laboratories in the several hospitals and medical schools as to their capacity for accommodating visitors. When the limit of attendance has been reached through advance registration no further applications will be accepted, hence the necessity for early registration. It has been our experience that the limit of attendance will be reached several weeks in advance of the meeting.

CLINIC TICKETS

The use of special clinic tickets has proven an efficient means of providing for the distribution of the visiting surgeons among the several clinics and insuring against overcrowding, as the number of tickets issued for any clinic is limited to the capacity of the room in which that clinic is to be given. Attendance at all clinics and demonstrations is controlled by means of such clinic tickets, which are issued at 8 o'clock at headquarters each morning for that day's clinics.

A complete detailed schedule of the day's clinics will be posted on bulletin boards at headquarters during the afternoon of the preceding day. After the program has been so posted, reservations for tickets for the next day's clinics may be filed, the tickets to be issued the following morning at 8 o'clock. A printed program will be issued each morning which will contain the complete clinical program for the day, with announcements of evening sessions and other information.

REGISTRATION FEE

In order that no financial burden may be imposed upon the members of the profession in the city entertaining the Congress, a registration fee of $5.00 is required of each surgeon attending the clinical meeting, such fee providing the funds with which to meet the expenses of conducting the meeting. A formal receipt for the registration fee is issued to each surgeon registering in advance which receipt is to be exchanged for a general admission card upon his registration at headquarters. This card, which is non-transferable, must be presented to secure clinic tickets and for admission to the evening meetings.